APPENDIX C

METHODOLOGY AND ASSUMPTIONS OF THE CENTRAL TRANSPORTATION PLANNING STAFF REGIONAL TRAVEL DEMAND MODELING FOR:

FOXBOROUGH COMMUTER RAIL STATION FEASIBILITY STUDY

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June 3, 2010

METHODOLOGY AND ASSUMPTIONS INTRODUCTION

The regional travel forecasting model set of the Central Transportation Planning Staff (CTPS) is based on procedures that have evolved over many years at CTPS. It follows the traditional four-step travel-modeling process of trip generation, trip distribution, mode choice, and trip assignment and is implemented in the EMME software package. This modeling process is employed to estimate present and future daily transit ridership and daily highway traffic volumes, primarily on the basis of demography and the characteristics of the transportation network. The model set simulates travel on the entire eastern Massachusetts transit and highway systems. When the model set is estimating future travel, the inputs include forecasts of demography and projections of transit and highway improvements.

This report describes in detail the model set used for the Foxborough Commuter Rail Station Feasibility Study. The model set will generally be referred to as "the model," for simplicity's sake. This report is organized into the following subsections:

Description of the Model

- Overview of the Four Steps
- Notable Features of the Model
- Model Structures and Inputs
- Calibration of the Model

The Four Steps of the Travel Demand Modeling Process

- Trip Generation
- Trip Distribution
- Mode Choice
- Trip Assignment

Air Quality Analysis

DESCRIPTION OF THE MODEL

OVERVIEW OF THE FOUR STEPS

In the first step, the total number of trips generated by residents of the 182 municipalities constituting the modeled area are calculated using demographic and socioeconomic data. Similarly, the number of trips attracted to different types of land uses, such as employment centers, schools, hospitals, shopping centers, etc., is estimated using land use data and trip generation rates obtained from household travel surveys. This information is produced at the level of disaggregated geographic areas known as transportation analysis zones (TAZs). All calculations are performed at the TAZ level.

In the second step, trip distribution, the model determines how the trips generated in each TAZ are distributed throughout the region. Trips are distributed based on transit and highway travel times, distances, and costs between TAZs and on the relative attractiveness of each TAZ, which is measured by the number of trips generated by that TAZ.

Once the number of trips of each purpose between each pair of TAZs is determined, the mode choice step of the model (step three) allocates the trips among the available modes of travel. The available modes of travel are walk, auto (single-occupancy vehicle [SOV] and carpool), and transit (subdivided by access mode: walking to transit or driving to transit). To determine the proportion of trips to allocate to each mode, the model takes into account the travel times and distances, number of transfers required, parking availability, and costs associated with each option. Other variables, such as auto ownership and household size, are also included in the model.

After estimating the number of trips by mode for each purpose for all possible TAZ pairings, the model assigns trips to their respective specific routes in trip assignment (the fourth and final step). This is necessary because there is often more than one highway route or transit path between two TAZs.

Various reports showing the transit ridership on different transit modes (including the specific ridership on each of the existing and proposed individual transit lines) and traffic volumes on the highway network are produced as needed. A schematic representation of the modeling process is shown in Figure 1.

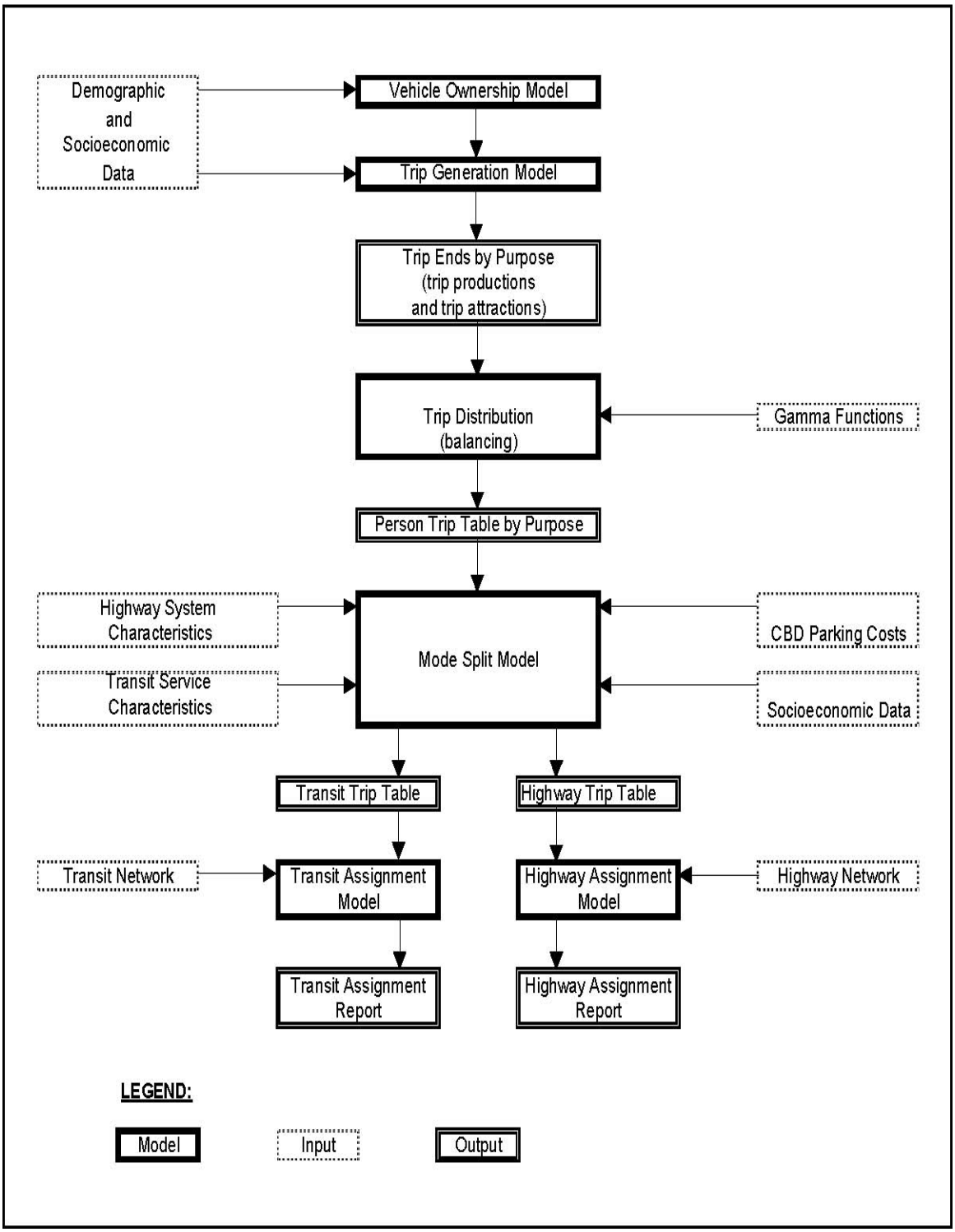
NOTABLE FEATURES OF THE MODEL

The model used for the Foxborough Commuter Rail Station Feasibility Study employs the best component models, networks, and input data available to CTPS at this time. Some of the notable features of the model are as follows:

- It incorporates both motorized and non-motorized trips.
- It simulates transit and highway travel during four time periods of a typical weekday.

FIGURE 1

The Four-Step Demand Modeling Process



- The trip generation, trip distribution, and mode choice components are well calibrated.
- EMME software used in implementing the model is capable of performing multi-class, multi-path assignment that is superior to the traditional all-or-nothing assignment.
- The procedure that estimates air quality benefits is sophisticated and well integrated within the main model.

MODEL STRUCTURES AND INPUTS

Modeled Area

The modeled area encompasses 182 cities and towns in eastern Massachusetts, which includes the 101 Boston Region MPO cities and towns and 81 additional communities, as shown in Figure 2. The figure also shows the boundaries of five concentric rings into which the modeled area is divided for model estimation and calibration purposes. These rings were referred to in subsequent discussions.

Zone System

The modeled area is divided into 2,918 internal TAZs. There are 117 external stations around the periphery of the modeled area that allow for travel between the modeled area and adjacent areas of Massachusetts, New Hampshire, and Rhode Island.

Transportation Networks

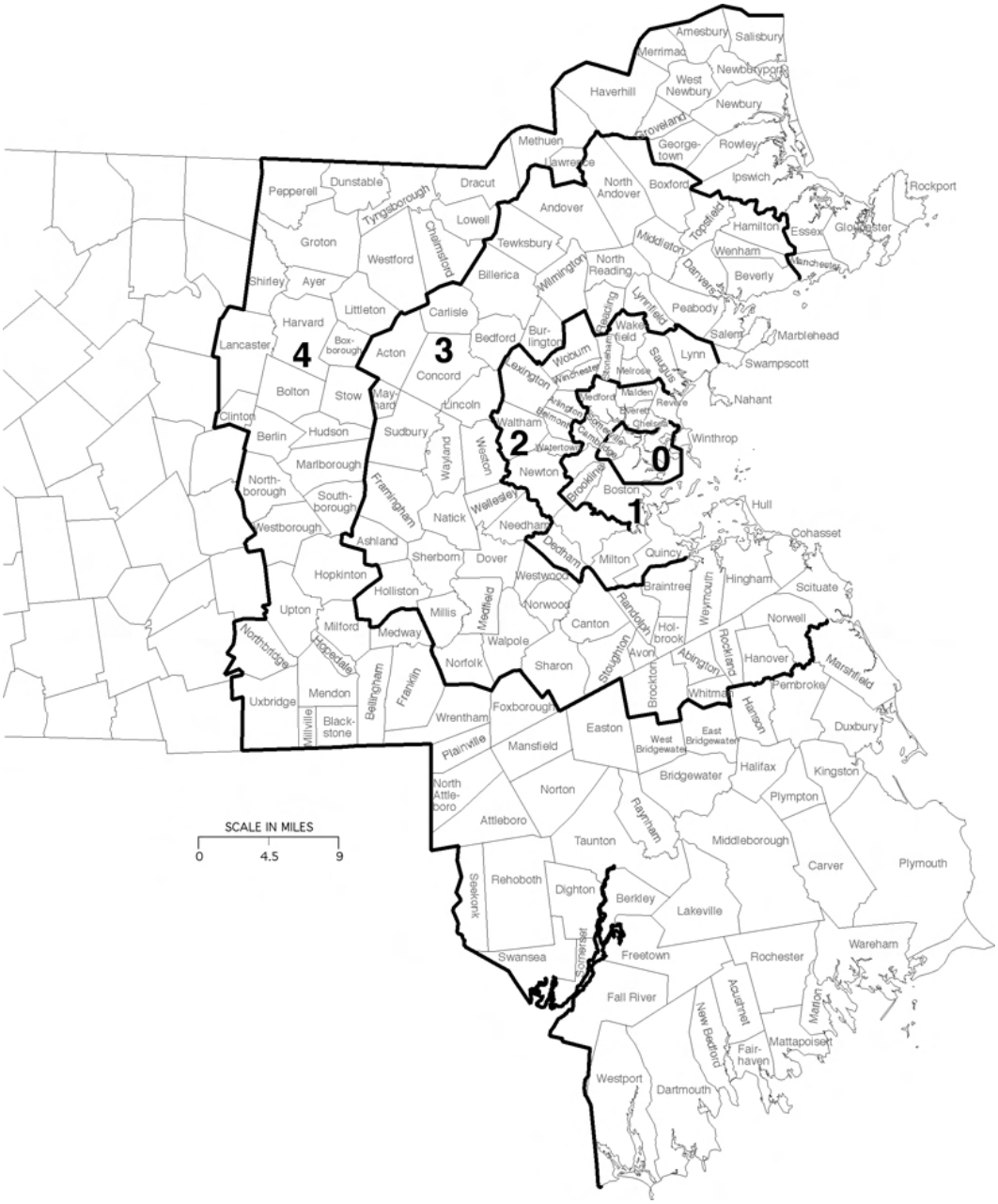
There are two types of network: transit and highway. Both are integrated in EMME. The highway network comprises express highways, principal and minor arterials, and local roadways. The transit network comprises commuter rail lines, rapid transit lines, bus lines (MBTA and private carriers), and boat lines. The model contains service frequency (i.e., how often trains and buses run), routing, travel time, and fares for all lines.

- *Highway Network*: The regional highway network contains in excess of 100,000 links and 24,000 nodes. It is fairly dense in the study area, although like any modeled network, it does not include some local and collector streets. Each link is coded with the appropriate free-flow speed, number of lanes, and lane capacity. Functional class is coded, as are various geographic flags useful for summarizing emissions. Another code is used to distinguish links open only to HOVs from all other links.

- *Transit Network*: The transit network represents all regional transit agency bus and rail services in eastern Massachusetts, as well as private express buses and ferries. Most-likely travel paths are built through the network, then skimmed, and the resulting impedances are input to the trip distribution and mode choice models. After

mode choice, transit trip tables by time of day are assigned to the network travel paths.

FIGURE 2
CTPS Modeled Area and Ring Boundaries



Major Data Inputs

CTPS's travel model underwent a major revision in 1993, and several important data sources were used in that revision. Those and other major data items underlying the model are as follows:

- *Household Travel Survey:* In 1991, CTPS conducted a household travel survey. The survey took the form of an activity-based travel diary that was filled out for one weekday. Approximately 4,000 households, generating some 39,000 weekday trips, were represented in the final database. The data were used to estimate new models for trip generation, auto ownership, trip distribution, and mode choice.

- *External Cordon Survey:* Also in 1991, a survey of automobile travelers bound for the modeled area from adjacent areas was performed. Survey results were used in trip generation and distribution to update estimates of external trips.

- *Site-Level Employment Database:* Employment estimates for 2000 were taken from a single, unified regional employment database based on employment data from the Department of Employment and Training and on extensive research by CTPS. Aggregate employment data for the year 2007 were used to update this database for use for the base-year analysis in the regional model version used for this study.

- *2000 U.S. Census:* Various census files were used in model estimation and calibration processes. In particular, Census Journey to Work information was incorporated into the model at several stages of model development.

- *Ground Counts:* Transit ridership and highway traffic volume data representing early 1990s conditions were amassed into a database and used to calibrate the components of the travel model. Updated counts and volumes have been used for model validation.

- *On Board Transit Survey:* CTPS surveyed passengers on all MBTA transit modes in an effort spanning the years 2008-2010. Data from this survey, specifically for transit service in the study area, were used to validate and calibrate components of trip distribution and mode choice for the model.

Analysis Year

The base year is 2009 and the forecast horizon year is 2030.

Time-of-Day Considerations

The mode choice and transit assignment steps of the modeling process are conducted on the basis of time periods. The four time periods modeled are an AM peak period (6:00 AM–9:00 AM), a midday period (9:00 AM–3:00 PM), a PM peak period (3:00 PM–6:00 PM), and a nighttime period (6:00 PM–6:00 AM). The trip generation model, however, is based on daily trips. The trip

distribution model considers two time periods: peak (the AM peak and PM peak periods) and off-peak.

The trip volumes produced by the trip generation model are split into peak and off-peak period trips, the trip tables produced by the trip distribution model are split into the four time periods defined above, and the highway vehicle trips and transit person trips created by the mode choice model are converted from production/attraction format to an origin/destination format, based upon factors created from the data collected in the 1991 Household Travel Survey.

The final trip tables created for each time period reflect observed levels of congestion on the highway system. The results of the four assignments are summed to obtain daily (average weekday traffic [AWDT]) results.

Population, Household, and Employment Forecasts

Households and employment by type are major inputs to the travel model process: they are the variables upon which trip generation estimates are based. The forecasts for the region were developed by combining household and employment predictions independently produced by the seven regional planning agencies/metropolitan planning organizations (RPAs/MPOs) in eastern Massachusetts: the Central Massachusetts Regional Planning Commission (CMRPC), Merrimack Valley Planning Commission (MVPC), Metropolitan Area Planning Council (MAPC), Montachusett Regional Planning Commission (MRPC), Northern Middlesex Council of Governments (NMCOG), Old Colony Planning Council (OCPC), and Southeastern Regional Planning and Economic Development District (SRPEDD).

Forecasts for the 101 cities and towns that make up the Boston Region MPO area were developed by MAPC based on its MetroFuture land use scenario. Forecasts for the 63 communities in the model belonging to RPAs/MPOs other than the Boston Region MPO were developed in a slightly different fashion. Each RPA/MPO independently maintains its own travel demand model, TAZ system, base-year estimates, and future-year forecasts. However, the Boston Region MPO's year 2000 base-year data have long been widely accepted as the most refined and detailed data set for the year 2000 for eastern Massachusetts, and significant faith has been invested in this data set in other studies, past and ongoing. Therefore, in the present modeling effort, future-year forecasts for these 63 communities pivoted off this vetted and reliable data but allowed for the growth projections envisioned by the individual RPA/MPO. This was done by adding the absolute changes in population and households predicted by the RPA/MPOs for the 63 communities to the Boston Region MPO's base-year estimates.

Employment forecasts were developed differently but also used the absolute change projected by the RPA/MPO and also pivoted off the Boston Region MPO's year 2000 data. The future-year Boston Region MPO distribution of employment by TAZ and by employment sector was applied to the RPA/MPO's absolute change at the community level. The resulting change was then

added to the base-year Boston Region MPO employment data to produce the future-year forecasts. This hybrid approach took advantage of the accuracy of the Boston Region MPO's widely accepted demographic data sets while still capturing and respecting the growth expressed and projected by the individual RPAs/MPOs.

For the 18 SRPEDD communities not within the boundaries of the standard CTPS regional travel demand model set, SRPEDD land use forecasts and base year estimates of population, households, and employment were used. These SRPEDD forecasts were constrained by town-level control totals developed by the Executive Office of Transportation and Public Works (EOT). In some instances SRPEDD re-allocated demographics within one of the given 18 communities, but in all instances the EOT town-level control totals were maintained.

CALIBRATION OF THE MODEL

Calibration is the process in which model results or outputs are compared with observed data in order to assess the accuracy of a model. The model set used in the Foxborough Commuter Rail Station Feasibility Study underwent an extensive calibration process. For the base year, the trip distribution, mode choice, and trip assignment models were run through an iterative feedback loop several times to estimate the most accurate model parameters possible. This process constitutes a feedback loop in that certain outputs from each model are in turn used as an input into another model. For instance, highway and transit skims are an output of the assignment model but are also an input into the trip distribution and mode choice models. An accurate model set can thus be obtained by iteratively running this chain of models until the products do not change significantly.

Within this iterative calibration process, particular attention were paid to the mode choice model parameters. Certain mode choice coefficients were estimated so that mode shares produced by the model match observed mode shares found in the area being represented. The observed data to which the mode choice model were calibrated are from the Household Travel Survey and 2000 U.S. Census Journey to Work data.

Within the iterative calibration process, the final product—highway and transit volumes loaded onto the network—will also be given close attention. The observed data to which the highway and transit assignment results were calibrated included observed highway counts, transit counts, and transit information from specific transit project studies.

In 2007, the Massachusetts Bay Transportation Authority (MBTA) was awarded a discretionary grant under the Federal Transit Administration (FTA)'s Alternatives Analysis Program for a new system-wide onboard survey of the rapid transit, bus, bus rapid transit (BRT), commuter rail, and water transportation services. This grant, in conjunction with matching local monies, enabled CTPS to conduct a thorough surveying effort, in excess of one million dollars, of all MBTA transit services in 2008 and 2009. CTPS is currently in the process of finishing the analysis of all of the returned surveys. The results of this survey will provide the MBTA, state and federal agencies, consultants, and the public with analytical tools that are more up-to-date to use in effectively and efficiently conducting transportation-planning activities. The new survey data

will enhance CTPS´s ability to validate and calibrate the Boston Region MPO´s regional travel demand model.

A wealth of information was collected from the surveyed respondents that are germane to the proper functioning of a travel demand model's distribution, mode choice, and assignment routines. Among the transit-related data gathered or derived from the survey results are:

- Boarding Location
- Alighting Location
- Trip origin location
- Trip destination location
- Station-to-station trip flows
- Origin-destination transit trip flows and patterns
- Egress mode and time
- Access mode and time
- Trip purposes
- Trip lengths
- Transfer information
- Frequency of ridership
- Fare media usage
- Ridership demographics (Race, Gender, Age, Income, vehicle ownership, etc.)
- Submodal usage

Many of these data were useful in the calibration process for the model set used for the Foxborough Commuter Rail Station Feasibility Study.

Calibration Performance Measures

Highway assignment results were compared to observed road counts along several screen lines and at several different locations on major area highways. The model was calibrated to these counts along the screenlines.

Transit assignment results were scrutinized on several levels. For transit boardings and station-to-station trip flows for the rapid transit system CTPS tried to model these statistics to within five percent of the observed counts and data; for the commuter rail CTPS tried to model these statistics to within 10-12% and for the bus system to within 10-15%. Special attention was paid to calibrating the Franklin and Providence commuter rail lines.

THE FOUR STEPS OF THE TRAVEL DEMAND MODELING PROCESS

TRIP GENERATION

The first step in the travel forecasting process is trip generation. This model uses socioeconomic characteristics of the region's population and information about the region's transportation infrastructure, transportation services, and geography to predict the amounts of travel that were produced by and attracted to each of the TAZs within the region.

The trip generation model is composed of seven parts:

- Base-year detailed inputs
- Future-year inputs
- Estimation of detailed input requirements for future years
- Estimation of detailed socioeconomic characteristics
- Estimation of vehicle ownership
- Estimation of trip productions and attractions
- Balancing of trip productions and attractions

A description of each of these parts is presented below.

Base-Year Detailed Inputs

The base-year inputs required for the trip generation model are presented in Table 1.

Table 1:
Trip Generation Model: Base Year Input Requirements

Data	**Source**	**Geographic Level**
Population	2009 estimates	TAZ (census block)
Group Quarters Population	2009 estimates	TAZ (census block)
Household Size, Income, Workers, Vehicles	2009 estimates	TAZ (census block)
Population Age	2009 estimates	City or town
Basic, Retail, Service Employment	2009 estimates	TAZ
Public K-12 Employment	2009 estimates	TAZ
Private K-12 Employment	2009 estimates	TAZ
College Employment	2009 estimates	TAZ

Table 1: **Trip Generation Model: Base Year Input Requirements**		
Data	**Source**	**Geographic Level**
Resident Workers	2009 estimates	TAZ (census block group)
Dorm Population	2009 estimates	TAZ (census block)
Labor Participation Rate by Age Group	Bureau of the Census	Region
Land Area	CTPS regional database	TAZ
Geographical Ring	CTPS regional database	TAZ
Public Use Microdata Areas	CTPS regional database	Public Use Microdata Areas
External Trip Productions and Attractions	1991 External Travel Survey, 2000 U.S. Census	External station
External Growth Factors	RPA and CTPS forecasts	External station
Transit Walk Access Factor	Transit network	TAZ
External Attraction and Production Terminal Times	1991 External Travel Survey	External station

Future-Year Inputs

The future-year inputs required for the trip generation model, some of which are the same as for the base year, are:

- Total TAZ households
- Total TAZ population
- Total TAZ group quarters population
- Total community population by age
- TAZ employment in basic industries
- TAZ retail trade employment
- TAZ employment in service industries
- Regional labor participation rates
- External trip production and attraction growth factors
- Transit walk-access factors

Estimation of Detailed Input Requirements for Future Years

Various procedures are used to prepare the trip generation model input data for future years. The variables that are estimated in these procedures are listed below. A description of how future-year estimations for these variables are made follows the list.

- Households by household size
- Households by income quartile
- Resident workers
- Households by workers per household
- School employment (K-12 and college)
- Dorm population
- External person trips
- Attraction and production terminal times

Household Size

The change in TAZ average household size is implied in the base-year inputs and future-year forecasts (total population minus group quarters population divided by total households). The distribution of future-year households by household size is estimated by the following procedure:

First, the future-year households are distributed among the household size categories in the same proportions as in the base year. It is then assumed that all households capable of making the implied change (households of two or more for household size reductions; all households for household size increases) will have the same probability of changing in size by one person. This probability of changing is set equal to the extent needed to match the forecasted change in household size, and the resulting distribution of households by household size is used for the future-year scenario.

As an example, suppose that in the base year the numbers of 1-person, 2-person, 3-person, 4-person, 5-person, and 6+-person households are, respectively, 100, 200, 50, 25, 10, and 5, with a total household population of 835. This represents an average household size of 2.141. If there were 780 future-year households, they would initially be distributed as 200, 400, 100, 50, 20, and 10 1-person, 2-person, 3-person, 4-person, 5-person, and 6+-person households, respectively.

However, if the future-year average household size were 2.000, then the households with 2 or more persons would have a 19 percent [(2.141 - 2) * 780/580] probability of dropping in size by one. The resulting distribution would thus be estimated as follows:

276 1-person households [200 + (.19 * 400)]
343 2-person households [400 – (.19 * 400) + (.19 * 100)]
90.5 3-person households [100 – (.19 * 100) + (.19 * 50)]
44.3 4-person households [50 – (.19 * 50) + (.19 * 20)]
26.2 5+-person households [20 – (.19 * 20) + 10]

In the case of TAZs with no households in the base year, the proportional distribution of households by household size at the community level is used for the base year in these calculations.

Household Income

The future-year distribution of households by household income quartile is estimated by assuming that the proportional distribution of households by income quartile remains constant within each TAZ. In the case of TAZs with no households in the base year, the proportional distribution of households by household income at the community level is used for the base year.

Resident Workers per Household

The change in the number of resident workers at the community level is obtained by multiplying the base-year and future-year estimates of over-age-15 population by labor force participation rates by age cohort. Dividing the base-year and future-year estimates of community-level resident workers by the base-year and future-year numbers of households in the community, respectively, produces estimates of the base-year and future-year average workers per household. All of the TAZs within each community are assumed to have the proportional change in workers per household implied by these base-year and future-year community-level estimates. Multiplying the resultant estimate of resident workers per household by the forecasted number of households yields the forecasted number of resident workers by TAZ.

For example, assume that a community's 2000 and 2010 populations are distributed by age as follows: 1,000 and 1,200, 10,000 and 11,000, 2,000 and 2,500, and 500 and 600, respectively, in the 16-24, 25-54, 55-64, and 65+ age ranges. If the applicable labor force participation rates are applied (see Table 2), the estimated numbers of community resident workers become 10,317 and 11,785 for 2000 and 2010, respectively. If the estimated numbers of community households were 5,500 and 6,000 for 2000 and 2010, respectively, the community average workers per household for 2000 and 2010 would be 1.88 and 1.96, respectively. As 1.96 is 4.3% greater than 1.88, all of the TAZs in that community would be assumed to have a 4.3% increase in workers per household between 2000 and 2010.

Table 2:
Labor Force Participation Rates

Age	2000	2010	2025	2030
16-24	65.9%	63.9%	63.4%	63.4%
25-54	84.1%	84.7%	85.1%	85.0%
55-64	59.2%	64.4%	63.6%	63.7%
65+	12.8%	15.2%	15.6%	14.5%

Household Workers

The future-year number of households per TAZ within each category of number of workers per household is estimated by using workers-per-household distribution curves developed by CTPS from the 1990 U.S. Census. These curves, summarized in Table 3 below, indicate a default percentage distribution of households for the base-year and future-year TAZ estimates of average workers per household. The proportional changes in the default number of households within each category of workers per household implied by this comparison are applied to the actual base-year TAZ distribution of households to obtain the distribution of households by workers per household to be used for the future scenario. The average number of workers per household at the community level is used for the base year in TAZs with no households in the base year.

For example, if the average number of workers per household changes from 1.7 to 1.8, the default distribution of households among the categories 0-worker, 1-worker, 2-worker, and 3+-worker would change from 7%, 32%, 45%, and 16% to 5%, 29%, 47%, and 19%, respectively. If the actual base-year distribution of households among those categories is 8%, 31%, 44%, and 17%, the changes in the default distributions indicate a future-year distribution of households of 6%, 28%, 46%, and 20% 0-worker, 1-worker, 2-worker, and 3+-worker households, respectively.

School Employment

- K-12

  The level of employment in schools providing education up to the 12th grade is assumed to be proportional to the number of community residents of ages 5-19.

- College

  The level of employment at all colleges and technical schools within the region is assumed to be proportional to the number of regional residents of ages 20-24.

Table 3:
Workers per Household Diversion Curves

Avg. Workers per HH	Households by Number of Workers				
	0	**1**	**2**	**3+**	**Total**
<=.45	58%	40%	2%	0%	100%
.45 - .55	52%	46%	2%	0%	100%
.55 - .65	47%	46%	6%	1%	100%
.65 - .75	43%	46%	10%	1%	100%
.75 - .85	38%	46%	13%	3%	100%
.85 - .95	34%	46%	16%	4%	100%
.95 - 1.05	30%	45%	20%	5%	100%
1.05 - 1.65	65% - (35% * Avg)	60% - (16% * Avg)	(36% * Avg) - 15%	(15% * Avg) - 10%	100%
1.65 - 1.75	7%	32%	45%	16%	100%
1.75 - 1.85	5%	29%	47%	19%	100%
1.85 - 1.95	4%	26%	48%	22%	100%
1.95 - 2.05	3%	22%	48%	27%	100%
2.05 - 2.15	2%	18%	49%	31%	100%
2.15 - 2.25	1%	14%	49%	36%	100%
2.25 - 2.35	1%	10%	49%	40%	100%
2.35 - 2.45	1%	4%	50%	45%	100%
2.45 - 2.55	1%	4%	50%	45%	100%
> 2.55	0%	5%	50%	45%	100%

Dorm Population

The dorm population within a TAZ is assumed to be proportional to the total group quarters population within a TAZ.

External Person Trips

Base-year external person trips are adjusted to produce traffic volumes at the external stations that match the observed counts for the base year. These base-year external person trips are then adjusted according to growth factors for the vehicle volumes at each external station. These growth factors are presently based upon an analysis of historical trends.

Attraction and Production Terminal Times

The attraction and production terminal times (the time it takes to travel between a vehicle and the trip origin or destination) are estimated through the application of a model developed at CTPS. This model first estimates terminal times as a function of household density (see Table 4). An alternative estimate of the production and attraction terminal times for each TAZ is based on employment density ranges (see Table 5). For regional modeling, the larger of the two estimates is assigned to a TAZ. Several TAZs with regionally unique characteristics (locations of major generators such as airports or large colleges) were assigned terminal times in the base year different from those estimated by the terminal-time model. In these cases, the model is used to estimate changes in terminal times.

Table 4:
Household Terminal Time

Household Density (HH per acre)	**Production (minutes)**	**Attraction (minutes)**
0 - 5	1	1
5 - 10	2	2
10 - 15	3	3
15 - 25	4	4
> 25	5	5

Table 5:
Employment Terminal Time

Employment Density (employees per acre)	**Production (minutes)**	**Attraction (minutes)**
0 - 5	0	0
5 - 10	1	1
10 - 25	2	2
25 - 50	3	3
50 - 100	4	4
100 - 200	5	5
> 200	6	6

Estimation of Detailed Socioeconomic Characteristics

A three-way distribution of the households within each TAZ by household size, income, and workers is required in order to estimate the distribution of households by vehicle ownership levels. While this is available from the U.S. Census at the subregional level, such distributions at the TAZ level are estimated through iterative proportional fitting techniques. Using the appropriate subregional matrix as a seed, the cell values are adjusted through 10 iterations to match row and column totals to the estimated TAZ-level totals in order to produce an estimated three-way distribution of households for each TAZ.

Estimation of Vehicle Ownership

Base-year households are distributed by vehicle ownership based on data from the 2000 U.S. Census. The distribution of future-scenario households by vehicle ownership is estimated through the application of a set of models developed by CTPS.

The CTPS vehicle ownership model was estimated as a set of four multinomial logit disaggregate choice models, one for each of four income categories, in which the decision maker was the household unit and the set of alternatives was the ownership, by the household, of 0, 1, 2, or 3-or-more vehicles. In this model, households are segmented into four income categories, since income is believed to be the most significant variable in vehicle-ownership choice. Other variables included in the model are household size, workers per household, household density, employment density, household location, and transit walk-access factors. The data set used to estimate this model contained 3,504 observations. Once estimated, the model was validated to observed vehicle ownership data. The models, one for each household income quartile, are presented in Table 6.

Estimation of Trip Productions and Attractions

The number of trip productions and trip attractions within a TAZ are estimated through the application of a set of models developed at CTPS. These models estimate the number of trip productions and attractions as a function of household size, workers per household, vehicles per household, income, household location, number of households, basic employment, retail employment, college employment, school employment, and service employment. The trip production models for the home-based purposes [home-based work (HBW), home-based work-related (HBWR), home-based personal business (HBPB), home-based social-recreational (HBSR), home-based school (HBSC), and home-based pick-up/drop-off (HBPD)] are presented in Table 7, and the trip production models for the non-home-based purposes [non-home-based work (NHBW) and non-home-based-other (NHBO)] and the trip attraction models for all purposes are presented in Table 8.

Table 6:
Summary of Vehicle Ownership Model

	Constant	HH Size	Workers per HH	HHs per Acre	Employ per Acre	High-Density	Low-Density	Ring01	Transit Walk-Accessibility
Low-Income Household Model									
0 Vehicles	-0.0474	-0.1692	-0.1312	0.0239		0.7136			
1 Vehicle									
2 Vehicles	-3.139	0.6182	0.4414	-0.0424					
3+ Vehicles	-5.074	0.7968	0.6927	-0.2232					
Medium-Low-Income Household Model									
0 Vehicles	-1.573	-0.1874	-0.3417	0.05		0.5716		0.5392	
1 Vehicle									
2 Vehicles	-1.745	0.5202	0.4279	-0.0627	-0.0334				-0.0056
3+ Vehicles	-5.101	0.7371	1.112	-0.0627	-0.0693				
Medium-High-Income Household Model									
0 Vehicles	-2.63			0.0459		0.7704			
1 Vehicle									
2 Vehicles	-1.223	0.6609	0.2377	-0.0391			0.4026	-0.5962	-0.0054
3+ Vehicles	-4.572	0.7899	1.289	-0.0779				-1.223	-0.0073
High-Income Household Model									
0 Vehicles	-2.793			0.0349					
1 Vehicle									
2 Vehicles	0.5049	0.3475	0.2688	-0.06	-0.0154				-0.0074
3+ Vehicles	-3.807	0.5717	1.628	-0.136	-0.0468				-0.0077

High-Density = 1 if HH/acre > 6 or Employ/acre > 7
Low-Density = 1 if HH/acre < 0.5 and Employ/acre< 0.7
Ring01 = 1 if TAZ is in Ring 0 or Ring 1
Transit Walk-Accessibility = Portion of TAZ within walk-access distance of transit service

Balancing of Trip Productions and Attractions

Connecting a trip production with a trip attraction of the same trip purpose forms a trip. As a result, the number of productions and attractions for each trip purpose must be equal. In order to achieve this, the trip productions and attractions are balanced.

For most trip purposes, the number of attractions (as opposed to productions) is the less reliable estimate. Therefore, the normal balancing procedure is to set the total number of regional attractions equal to the difference between the grand total of productions and the total number of external attractions.

Table 7:
Home Based Trip Production Rate Models

Home-Based Work Trip Production Rates

Workers per HH	HH Size	Vehicles per HH 0	1	2+
1	*1*	0.94	1.17	1.11
1	*2*	1.01	1.23	1.18
1	*3*	1.15	1.38	1.32
1	*4*	1.48	1.70	1.65
1	*5+*	1.56	1.78	1.71
2	*2*	2.47	2.66	2.47
2	*3*	2.64	2.81	2.61
2	*4*	2.68	2.84	2.64
2	*5+*	2.83	2.99	2.79
3+	*3*	2.72	3.14	3.68
3+	*4*	2.75	4.02	4.55
3+	*5+*	2.88	4.15	4.68

Home-Based Personal Business Trip Production Rates

Workers per HH	HH Size	Vehicles per HH 0	1	2	3+
0	*1*	1.19	1.95	2.11	2.87
0	*2*	2.91	3.32	3.50	4.24
0	*3*	3.29	3.70	3.88	4.62
0	*4*	4.16	4.58	4.73	5.49
0	*5+*	1.56	4.71	4.87	5.63
1	*1*	0.50	1.01	1.20	1.27
1	*2*	1.85	2.35	2.55	2.62
1	*3*	2.25	2.82	3.04	3.11
1	*4*	2.52	2.91	3.08	3.13
1	*5+*	2.55	2.93	3.15	3.23
2	*2*	1.04	1.50	1.63	2.12
2	*3*	1.40	1.87	1.99	2.48
2	*4*	2.37	2.83	2.95	3.45
2	*5+*	2.44	2.91	3.03	3.52
3+	*3*	1.43	1.96	2.24	2.49
3+	*4*	2.00	2.75	3.14	3.49
3+	*5+*	2.34	3.20	3.67	4.08

HB Work-Related Trip Production Rates

HH Size	Workers per HH 1	2	3+
1	0.12		
2	0.10	0.18	
3	0.10	0.20	0.28
4	0.18	0.23	0.35
5+	0.21	0.29	0.41

Table 7:
Home Based Trip Production Rate Models (Con't)

Home-Based School Trip Production Rates

	HH	Household Income Quartile			
Ring	**Size**	**Low**	**Med-low**	**Med-high**	**High**
0 & 1	*1*	0.20	0.12	0.08	0.06
0 & 1	*2*	1.22	0.56	0.28	0.26
0 & 1	*3*	1.82	1.42	0.51	0.51
0 & 1	*4*	2.53	1.82	1.77	1.72
0 & 1	*5+*	5.07	4.05	3.04	2.53
2	*1*	0.15	0.03	0.02	0
2	*2*	0.41	0.18	0.13	0.05
2	*3*	1.30	0.92	0.35	0.25
2	*4*	2.01	1.55	1.47	1.19
2	*5+*	2.57	2.28	2.11	2.06
3 & 4	*1*	0.01	0.04	0.04	0.02
3 & 4	*2*	0.06	0.25	0.05	0.04
3 & 4	*3*	0.54	0.41	0.41	0.41
3 & 4	*4*	0.90	1.07	1.02	0.97
3 & 4	*5+*	1.35	2.53	2.24	1.85

HB Social/Recreational Trip Production Rates

HH	Workers per Household			
Size	**0**	**1**	**2**	**3+**
1	0.88	0.70		
2	1.79	1.13	1.17	
3	1.79	1.49	1.68	2.24
4	2.02	1.95	2.14	2.87
5+	3.58	3.50	3.85	3.94

HB Pick-up/Drop-off Trip Production Rates

HH	Vehicles per Household			
Size	**0**	**1**	**2**	**3+**
1	0.04	0.04	0.04	0.04
2	0.10	0.22	0.13	0.13
3	0.30	0.41	0.36	0.28
4	0.36	0.58	1.07	0.42
5+	0.85	1.73	1.58	1.08

Table 8:
Trip Attraction Rates and Non-Home Based Trip Production Rates

	Households	Basic Employment	Retail Employment	Service Employment		
				College	K-12	Other
Production Rate Models						
Non-Home-Based Work	0.07	0.47	1.78	1.86	0.93	0.93
Non-Home-Based Other	0.57		1.74	2.49	0.28	0.28
Attraction Rate Models						
Home-Based Work		1.42	1.64	1.23	1.23	1.23
Home-Based Work-Related		0.06	0.35	0.27	0.08	0.08
Home-Based Personal Business	1.25		4.17			
Home-Based Social/Recreational	1.28		1.34	1.13		
Home-Based School				3.30	9.25	
Home-Based Pick-Up/Drop-Off	0.13	0.04	0.04	0.04	4.25	0.04
Non-Home-Based Work	0.11	0.32	2.36	1.85	0.79	0.79
Non-Home-Based Other	0.59		1.91	2.01	0.22	0.22

However, more information is available about regional patterns for the home-based work (HBW) trip during the base year. In order to produce base-year home-based work trip ends that reflect the observed patterns, the following changes are made as part of the base-year balancing procedure:

- Total regional HBW attractions are adjusted to match the base-year ratio of total regional HBW attractions to total regional HBW productions with the ratio from the 2000 U.S. Census Journey to Work data (1.077).
- Total external HBW attractions are adjusted to match the base-year ratio of total external HBW attractions to total regional HBW productions with the ratio from the 2000 U.S. Census Journey to Work data (.0442).
- Total external HBW productions are set equal to the difference between the grand total of HBW attractions and the regional HBW productions.

In addition, forecasts of future regional employment (the determinant of home-based work trip regional attractions) are available, so the estimates of future external HBW productions and attractions are less reliable than the estimates of future regional HBW productions and attractions. The model assumes that the number of external HBW productions will satisfy the forecasted employment within the region, so the HBW external productions are set equal to the difference between the total HBW attractions and the regional HBW productions.

TRIP DISTRIBUTION

The trip distribution model performs the second step in the travel forecasting process. It combines the estimated trip productions and trip attractions prepared by the trip generation model (combining the HBW and HBWR purposes into a new HBW purpose) into: an interregional vehicle trip table and an intraregional pick-up/drop-off vehicle trip table, to be used as input into the highway assignment model; and intraregional person trip tables to be used as inputs into the mode choice model.

The trip distribution model is made up of three components: a set of internal-external trip distribution models and two sets of intraregional trip distribution models (one for peak travel periods and the other for non-peak travel periods). An overview of the model is presented below.

Internal-External Trip Distribution

Internal-external trip distribution refers to a process in which all internal and external average weekday (AWD) trip ends (trip productions and attractions) are combined into trips using AWD highway impedances, but only the trips with one end in an internal zone and the other end in an external zone are retained. The resultant internal-external trip tables are used as inputs to the highway assignment model. The remaining trip ends are used as inputs to the intraregional trip distribution model.

The model includes a separate process for each of seven trip purposes: home-based work, home-based personal business, home-based social/recreational, home-based school, home-based pick-up/drop-off, non-home-based work, and non-home-based other. The process undertaken for each purpose consists of the following five steps:

- Convert highway travel times from time period origin-destination format to AWD production-attraction format
- Apply gamma functions to create an initial trip table estimate
- Initiate a three-dimensional balancing process, adjusting the initial trip table to match trip productions, trip attractions, and a trip-length frequency distribution
- Create internal/external vehicular trip tables
- Create intraregional person trip table productions and attractions

Each of these steps is described below.

Conversion of Highway Travel Times

Estimates of highway travel times are prepared using the highway assignment model on an origin-destination basis for each time period. In order to use these estimates with the trip productions and attractions from the trip generation model, the estimates from origin TAZ to destination TAZ and from destination TAZ to origin TAZ produced by the highway assignment are combined for each trip purpose based upon temporal directional factors developed for each trip purpose from the latest regional household travel survey.

Application of Gamma Functions

Interregional gamma functions are estimated using linear regression fitting to reflect the relationship between base-year highway travel time estimates and survey trip tables. These functions are used to provide an estimate of the number of trips within each cell of the trip table for a future scenario based upon the highway travel times for that future scenario.

The resultant trip table is referred to as the seed trip table. A trip length frequency distribution is imposed upon the seed trip table by dividing the table into classes of zone pairs. The zone pairs within each class connect a common pair of districts (forming an "interchange") and fall within a designated range of trip lengths (or "class"). A separate gamma function is used for each interchange. The number of interchanges and classes used for each trip purpose is presented in Table 9.

Table 9:
Number of Interchanges and Classes Used for Each Trip Purpose

	Internal-External		Intraregional Peak		Intraregional Non-Peak	
Trip Purpose	**Interchanges**	**Classes**	**Interchanges**	**Classes**	**Interchanges**	**Classes**
HBW	36	250	36	250	36	250
HBPB	36	250	34	228	36	246
HBSR	35	247	33	227	36	244
HBSC	24	229	16	218	16	224
HBPD	25	241	4	49	4	51
NHBW	36	250	36	250	36	249
NHBO	25	244	33	226	36	249

Three-Dimensional Balancing

The seed trip table is adjusted through an iterative process in order to match its subtotals as closely as possible to the estimated trip productions, trip attractions, and trip length frequency distribution. Each iteration consists of adjusting all the cells within a dimension (row, column, or class) by the factor needed to match the sum of that dimension to the estimated subtotal in that dimension (productions for row, attractions for column, trip length range trips for class) and then performing the same calculations for the other two dimensions. Since there is more confidence in trip production estimates than in the trip attraction or trip length frequency estimates, the iterative process ends with an exact matching of the trip table production totals to the input trip productions for each purpose.

Internal-External Trip Tables

The portions of the resultant trip table connecting external stations and regional TAZs are saved and adjusted for use in the highway assignment model. Vehicle occupancy data from the latest

external travel survey are used to convert the person trips to vehicle trips. Temporal and directional factors from the latest external travel survey are then used to convert the trips from one matrix of AWD trips from production zone to attraction zone to four matrices of time period trips from origin zone to destination zone.

Intraregional Productions and Attractions

The portions of the resultant trip table connecting a pair of regional TAZs are summed by TAZ of production and TAZ of attraction for use in the Intraregional Trip Distribution Model. Data from the latest household travel survey are used to split these trip production and trip attraction files into peak-period and non-peak-period files.

Intraregional Trip Distribution (Peak and Non-Peak)

Intraregional trip distribution refers to a process in which all peak-period and non-peak-period intraregional trip ends are separately combined into trips using composite impedances from the mode choice model. The resultant peak and non-peak intraregional trip tables are used as inputs to the mode choice model and highway assignment model.

The model includes a separate process for each of seven trip purposes: home-based work, home-based personal business, home-based social/recreational, home-based school, home-based pick-up/drop-off, non-home-based work, and non-home-based other. Similarly to the Internal-External Trip Distribution Model, the process undertaken for each purpose consists of the following three steps:

- Convert composite impedance estimates from time period to peak and non-peak format
- Apply gamma functions to create an initial trip table estimate
- Initiate a three-dimensional balancing process, adjusting the initial trip table to match trip productions, trip attractions, and a trip-length frequency distribution

The results of these steps are then processed to final form in the following two steps:

- Create pick-up/drop-off vehicular trip tables
- Create intraregional person trip tables

The five steps are described below.

Conversion of Composite Impedances

Estimates of purpose-specific composite impedances are prepared using the mode choice model for origin-destination TAZ pairs for each time period. In order to use these with the intraregional trip productions and attractions from the Internal-External Trip Distribution Model, the composite impedance estimates produced by the mode choice model are adjusted for production-attraction TAZ pairs for each trip purpose by temporal factors for each trip purpose from the latest regional household travel survey.

Application of Gamma Functions

Intraregional gamma functions are estimated using linear regression fitting to reflect the relationship between base-year composite impedance estimates and survey trip tables. These functions are used to provide an estimate of the number of trips within each cell of the trip table for a future scenario based upon the composite impedances for that future scenario.

The resultant trip table is referred to as the seed trip table. A trip length frequency distribution is imposed upon the seed trip table by dividing the table into classes of zone pairs. The zone pairs within each class connect a common pair of districts (forming an "interchange") and fall within a designated range of trip lengths (or "class"). A separate gamma function is used for each interchange. The number of interchanges and classes used for each trip purpose is presented in Table 9 (above).

Three-Dimensional Balancing

The seed trip table is adjusted through an iterative process to match its subtotals as closely as possible to the estimated trip productions, trip attractions, and composite impedance range frequency distribution. This process is the same as the one used in the Internal-External Trip Distribution Model. Since there is more confidence in trip production estimates than in the trip attraction or trip length frequency estimates, the iterative process ends with an exact matching of the trip table production totals to the input trip productions for each purpose.

Pick-Up/Drop-Off Vehicular Trip Tables

Since all trips for the home-based pick-up/drop-off purpose are assumed to be vehicular trips, the resultant trip tables for that purpose are converted directly to vehicular trip tables so that they can be used in the highway assignment model. Vehicle occupancy data from the latest household travel survey are used to convert the person trips to vehicle trips. Temporal and directional factors from the latest household travel survey are then used to convert the trips from matrices of peak-period and non-peak-period trips from production zone to attraction zone to matrices of time period trips from origin zone to destination zone.

Intraregional Person Trip Tables

The resultant trip tables for the other purposes are then prepared. Data from the latest household travel survey are used to split these peak-period and non-peak-period files into person trip tables for each time period. These trip tables are then used as inputs to the mode choice model.

MODE CHOICE

Overview

Mode choice is the third step in travel demand forecasting and in CTPS's regional travel demand model. It is the process in which the trips from distribution are split between the various available modes of the transportation network.

CTPS developed multinomial logit mode choice models by trip purpose using 1991 Household Travel Survey data, travel impedances obtained from highway and transit networks, 1990 and 2000 U.S. census data, and a variety of other data sources. The mode choice models estimate modal splits for four trip purposes: HBW, HBO (which includes HBPB and HBSR), HBSC, and NHB. These models have been calibrated and validated. The mode choice models are applied, by purpose, to the intraregional person trip tables that result from the trip distribution model.

The mode choice models split the trips for each purpose among six modes: 1) walk-access transit, 2) drive-access transit, 3) single-occupancy vehicles, 4) high-occupancy vehicles with two persons, 5) high-occupancy vehicles with three or more persons (for the HBW trip purpose only), and 6) a pure walk mode. The stations used in the execution of drive-access transit trips are identified using a special component of the mode choice model: a station choice model. Specific sub-mode selection (i.e., local bus, express bus, light rail, commuter rail, etc.) occurs during the transit assignment process.

The mode choice models estimate mode splits for intraregional trips only (trips contained within the model boundaries). They estimate mode shares for both inter-zonal trips (from one zone to another zone) and intra-zonal trips (from and to the same zone); however, intra-zonal trips are only split between the walk and auto modes.

Factors based upon the latest household travel survey are used to divide the trip tables produced by the trip distribution models into two trip tables: one for the trips made from production TAZ to attraction TAZ, the other for the trips made from attraction TAZ to production TAZ. The mode choice models are applied to these trip tables in two stages: first for the trips made from production TAZ to attraction TAZ (using the origin-destination input matrices), then for the trips made from attraction TAZ to production TAZ (using the inverse of the origin-destination input matrices).

Variables

The following are brief descriptions of the variables the mode choice models use to estimate mode splits:

Nest coefficient: Represents the degree of interactivity between the modes within the nest and other modes or nests. The value ranges between 0 and 1, with 1 indicating that switches to and from other modes are as likely as switches to and from modes within a nest. A value of 0 indicates there would be no switching between the nest modes and other modes.

In-vehicle travel time (IVTT): Represents time spent in the modal vehicle during a given trip.

Out-of-vehicle time: Includes all walk, boarding, and wait time.

Drive-access time: Represents driving time between a trip end and a transit station parking lot.

Terminal time: Represents the time it takes to travel between a vehicle and the trip origin or destination.

Fare: Represents the transit fare, in dollars, a transit rider will pay to use the system. Also included is one-half of any applicable parking costs (one-half because such costs are calculated on the basis of a one-way trip) at a transit station parking facility.

Auto cost: Represents auto operating and toll costs. Also included is one-half of any applicable parking costs (one-half because such costs are calculated on the basis of a one-way trip) on the street or in a parking facility. Also, for shared-ride modes, total auto costs are divided by the appropriate auto occupancy.

Household size: Represents the number of persons per household. This estimate is obtained from the trip generation model.

Vehicles/person: Represents the total number of vehicles per person in a household. Vehicles are estimated using the vehicle availability model described earlier.

Population density: Represents total population per acre of dry land.

Percent transit origins/destinations: Represents the AM peak period transit share of work trip ends within a TAZ, as computed by the home-based-work mode-choice model.

The Four Trip Purposes and the Station Choice Model

Home-Based Work Model

Home-based work (HBW) is the only trip purpose for which the mode choice models distinguish between two-person carpools (HOV2) and three-or-more-person carpools (HOV3+). The model specifications are shown in Table 10.

A transit nest is incorporated into the model on the basis that the decision to take transit over the other modes is made before selection of a particular transit mode. The transit coefficients are the same for both walk access (WAT) and drive access (DAT) and include coefficients for in-vehicle, initial wait, transfer wait, and total walk time. Drive-access time and production terminal times are included in DAT as one parameter.

The WAT fare includes the transit fare in dollars. For DAT, costs include the transit fare and half of any parking cost. Population density by traffic zone, in people per acre, is included in walk-access transit, and it is positively correlated: the greater the density, the more likely a traveler is to choose this mode. The zones with high population densities also have more transit stops. Vehicles per worker is a socioeconomic input unique to this trip purpose for DAT. It is also positively correlated, since a higher vehicles-per-worker ratio increases the likelihood of a vehicle's being available for a trip to a park-and-ride lot.

The auto times and cost coefficients are the same for the three auto modes. For HOV2 and HOV3+ the auto cost is divided by the average vehicle occupancies to reflect the sharing of costs between vehicle occupants. Household size is included as a positively correlated variable for the shared-ride modes and has a somewhat greater impact for HOV3+ than HOV2.

Table 10:
Home-Based Work Mode Choice Model Specifications

		Impedance Variable									Socioeconomic Variable		
	Nest Coeff	IVTT	Terminal Time	Walk Time	Initial Wait	Transfer Wait	Auto Access	Boarding Time	Fare ($)	Auto Cost ($)	Population Density	Vehicles/ Worker	HH Size
Drive-Alone													
Top Level	1	-0.05466	-0.292							-0.32			
Application Level		-0.05466	-0.292							-0.32			
Ratio to IVTT ($/hr)		1	5.34211							$ 10.25			
HOV2													
Top Level	1	-0.05466	-0.292							-0.32			0.07322
Application Level		-0.05466	-0.292							-0.32			0.07322
Ratio to IVTT ($/hr)		1	5.34211							$ 10.25			-1.33955
HOV3+													
Top Level	1	-0.05466	-0.292							-0.32			0.2168
Application Level		-0.05466	-0.292							-0.32			0.2168
Ratio to IVTT ($/hr)		1	5.34211							$ 10.25			-3.96634
Walk													
Top Level	1			-0.1007									
Application Level				-0.1007									
Ratio to IVTT ($/hr)													
Walk-Access Transit													
Top Level	0.6791	-0.05466		-0.1007	-0.11292	-0.11292		-0.05466	-0.32		0.01889		
Application Level		-0.08049		-0.14828	-0.16628	-0.16628		-0.08049	-0.47121		0.02781		
Ratio to IVTT ($/hr)		1		1.8423	2.06593	2.06593		1	$ 10.25		-0.34551		
Drive-Access Transit													
Top Level	0.6791	-0.05466	-0.292	-0.1007	-0.11292	-0.11292	-0.13665	-0.05466	-0.32	-0.32		0.2897	
Application Level		-0.08049	-0.42998	-0.14828	-0.16628	-0.16628	-0.20122	-0.08049	-0.47121	-0.47121		0.4266	
Ratio to IVTT ($/hr)		1	5.34211	1.8423	2.06593	2.06593	2.5	1	$ 10.25	$ 10.25		-5.30011	

Home-Based Other Model

The home-based other (HBO) mode choice model combines the home-based shopping and home-based recreational trip tables output from the trip distribution process into a single HBO trip table. The model specifications are shown in Table 11. The model is similar to the HBW mode choice model, except for the following three differences. First, since there is only one shared-ride mode, HOV2+, household size is only a parameter for this one mode. Second, the vehicles per person in a household is used, as opposed to vehicles per worker. Finally, a distance dummy equal to one if the trip distance is less than a mile and zero otherwise is added to the walk mode. This reflects the fact that people taking short trips for this purpose are more likely to walk than choose another mode.

Non-Home-Based Model

The non-home-based (NHB) model splits work trips and non-work trips. The model specifications are shown in Table 12. There is a work dummy variable in the two auto modes which is equal to one if the trip is a non-home-based work trip and zero otherwise. The coefficient is positive for SOV and negative for HOV, indicating that the SOV mode is more likely on work-related trips than on non-work trips. The percentage of trips attracted to the origin and destination zones that is SOV is a variable in the drive-alone mode. The percentage is taken from the results of the HBW mode choice model and is positively correlated. Finally, the distance dummy in the walk mode is equal to one if the distance is less than a mile. It has a positive coefficient.

Home-Based School Model

The home-based school (HBSC) model was re-estimated and restructured in 2004 to allow for compatibility of the HBSC purpose with the Federal Transit Administration's Summit program. The previous HBSC model had one nest comprising all motorized modes. The revised HBSC model has two nests, transit and highway. The revised HBSC model specifications are shown in Table 13.

Station Choice Model

The final part of the mode choice model is the assignment of drive-access transit trips to transit stations in the station choice model. This model uses estimates of highway travel times and costs from the highway assignment model, estimates of transit impedances from the walk-access transit assignment model, and estimated transit parking lot capacities to distribute drive-access transit trips among the transit stations with parking lots. The model also estimates the impedances associated with the drive-access transit trips between each TAZ pair and, if parking at the transit parking lots is constrained, reassigns demand for full parking lots to other parking lots or to other modes of transportation.

Table 11:
Home Based Other Mode Choice Model Specifications

		Impedance Variable									Socioeconomic Variable			
	Nest Coeff	IVTT	Terminal Time	Walk Time	Initial Wait	Transfer Wait	Auto Access	Boarding Time	Fare ($)	Auto Cost ($)	Population Density	Vehicles/ Worker	HH Size	Distance Dummy
Drive-Alone														
Top Level	1	-0.01965	-0.2308							-0.22378				
Application Level		-0.01965	-0.2308							-0.22378				
Ratio to IVTT ($/hr)		1	11.7463							$ 5.27				
HOV2+														
Top Level	1	-0.01965	-0.2308							-0.22378			0.1976	
Application Level		-0.01965	-0.2308							-0.22378			0.1976	
Ratio to IVTT ($/hr)		1	11.7463							$ 5.27			-10.0566	
Walk														
Top Level	1			-0.05895										0.9005
Application Level				-0.05895										0.9005
Ratio to IVTT ($/hr)														-15.2757
Walk-Access Transit														
Top Level	0.3722	-0.01965		-0.05895	-0.05895	-0.05895		-0.01965	-0.22378		0.00883			
Application Level		-0.05279		-0.15838	-0.15838	-0.15838		-0.05279	-0.60123		0.02373			
Ratio to IVTT ($/hr)		1		3.0002	3.0002	3.0002		1	$ 5.27		-0.44951			
Drive-Access Transit														
Top Level	0.3722	-0.01965	-0.2308	-0.05895	-0.05895	-0.05895	-0.04912	-0.01965	-0.22378	-0.22378		0.71239		
Application Level		-0.05279	-0.6201	-0.15838	-0.15838	-0.15838	-0.13198	-0.05279	-0.60123	-0.60123		1.914		
Ratio to IVTT ($/hr)		1	11.7463	3.0002	3.0002	3.0002	2.5	1	$ 5.27	$ 5.27		-36.2564		

Table 12:
Table 7:
Home Based Trip Production Rate Models

		Impedance Variable									Socioeconomic Variable		
	Nest Coefficient	IVTT	Terminal Time	Walk Time	Initial Wait	Transfer Wait	Auto Access	Boarding Time	Fare ($)	Auto Cost ($)	Work Dummy	Distance Dummy	Percent SOV
Drive-Alone													
Top Level	1	-0.03022	-0.3197							-0.1817	0.1926		0.00885
Application Level		-0.03022	-0.3197							-0.1817	0.1926		0.00885
Ratio to IVTT ($/hr)		1	10.5791							$ 9.98	-6.37326		-0.29295
HOV2+													
Top Level	1	-0.03022	-0.3197							-0.1817	-0.7627		
Application Level		-0.03022	-0.3197							-0.1817	-0.7627		
Ratio to IVTT ($/hr)		1	10.5791							$ 9.98	25.2383		
Walk													
Top Level	1			-0.07525								0.493	
Application Level				-0.07525								0.493	
Ratio to IVTT ($/hr)												-6.5515	
Walk-Access Transit													
Top Level	1	-0.03022		-0.07525	-0.08333	-0.08333		-0.03022	-0.1817				
Application Level		-0.03022		-0.07525	-0.08333	-0.08333		-0.03022	-0.1817				
Ratio to IVTT ($/hr)		1		2.49007	2.75745	2.75745		1	$ 9.98				
Drive-Access Transit													
Top Level	1	-0.03022	-0.3197	-0.07525	-0.08333	-0.08333	-0.07555	-0.03022	-0.1817	-0.1817			
Application Level		-0.03022	-0.3197	-0.07525	-0.08333	-0.08333	-0.07555	-0.03022	-0.1817	-0.1817			
Ratio to IVTT ($/hr)		1	10.5791	2.49007	2.75745	2.75745	2.5	1	$ 9.98	$ 9.98			

Table 13:
Home Based School Mode Choice Model Specifications

	Nest Coefficient	Impedance Variable							Population Density
		IVTT	Terminal Time	Walk Time	Wait Time	Drive-Access Time	Fare ($)	Auto Cost ($)	
Drive-Alone									
Top Level	0.5559	-0.0305	-0.0904					-0.1803	
Application Level		-0.0548	-0.1626					-0.3244	
Ratio to IVTT ($/hr)		1.0000	2.9672					$10.14	
HOV2+									
Top Level	0.5559	-0.0305	-0.0904					-0.1803	
Application Level		-0.0548	-0.1626					-0.3244	
Ratio to IVTT ($/hr)		1.0000	2.9672					$10.14	
Walk									
Top Level	1			-0.0791					
Application Level				-0.0791					
Ratio to IVTT ($/hr)									
Walk-Access Transit									
Top Level	0.5559	-0.0305		-0.0791	-0.0791		-0.1803		0.0150
Application Level		-0.0548		-0.1423	-0.1423		-0.3244		0.0270
Ratio to IVTT ($/hr)		1.0000		2.5967	2.5967		$10.14		-0.4927
Drive-Access Transit									
Top Level	0.5559	-0.0305	-0.0904	-0.0791	-0.0791	-0.0762	-0.1803	-0.1803	0.0150
Application Level		-0.0548	-0.1626	-0.1423	-0.1423	-0.1371	-0.3244	-0.3244	0.0270
Ratio to IVTT ($/hr)		1.0000	2.9672	2.5967	2.5967	2.5018	$10.14	$10.14	-0.4927

The probability of selecting a station is determined by the combination of utilities for the auto and transit legs of the drive-access transit trip. The utility of the auto leg (U_{ik}) is a combination of the auto travel time between production TAZ i and transit station k (ATT_{ik}) and the parking capacity at transit station k (PC_k).

$$U_{ik} = -.125\ ATT_{ik} + .001\ PC_k$$

The utility of the transit leg (U_{kj}) is a function of the composite impedance used in transit path selection, which includes transit in-vehicle travel time (ITT_{kj}), boarding time (BT_{kj}), waiting time (WtT_{kj}), and walk time (WkT_{kj}) accumulated between station k and attraction TAZ j.

$$U_{kj} = -.05 * (ITT_{kj} + BT_{kj} + (2 * (WtT_{kj} + WkT_{kj})))$$

The auto leg utilities are used to identify the five most likely stations to be used for each production TAZ, the combined utilities are used to estimate the probabilities of selecting each of those stations for each pair of TAZs, and the trips are assigned to transit stations. If transit parking is constrained to capacity, some trips may not be possible since the parking demand exceeds the capacity at the station, so, for those trips, the auto leg utilities are re-estimated to identify the five most likely stations with available parking capacity, and the trips are assigned to transit stations based upon the combined utilities. Trips which are still not assignable due to inadequate parking capacity are then switched to the walk-access transit, single-occupancy vehicle, or high-occupancy

vehicle mode in the same proportion of other trips of the same purpose between the same pair of TAZs.

TRIP ASSIGNMENT

Trip assignment is the fourth step in the travel demand forecasting process and in CTPS's regional travel demand model. Trip assignment is the process by which each trip in the trip tables resulting from the mode choice model is assigned to a specific submode (for example, bus or rapid transit) and a specific route. The CTPS model uses two distinct assignment procedures, one for the transit trips and one covering the highway modes.

Highway Assignment Routine

The highway assignment implemented in EMME is an equilibrium assignment. The fundamental assumption underlying such an assignment procedure is that each user of the highway network will choose the route that he or she perceives to be the best. The assignment is an aggregate assignment in that traffic volumes on any given link are an aggregate number, as opposed to being associated with a specific trip. There are several inputs used by the EMME equilibrium assignment procedure. The key inputs are the highway demand matrices, the volume delay function, and the highway network:

- Highway demand matrices

  The demand matrices that the highway assignment procedure uses as an input are the demand matrices that result from the mode choice and distribution models and other sources. These are origin-destination matrices of single-occupancy vehicles, trucks, taxis, internal-external trips, through trips, and high-occupancy vehicles.

  To prepare the mode choice trip tables for use in highway assignments, it is necessary to convert person trips to vehicle trips by applying vehicle occupancy factors for HOV modes. These occupancy factors, presented below, vary by trip purpose and are based upon the latest household travel survey.

Home-based work trips	HOV2: 2 persons/vehicle
	HOV3+: 3.373 persons/vehicle
Home-based other trips	HOV2+: 2.404 persons/vehicle
Home-based school trips	HOV2+: 2.788 persons/vehicle
Non-home-based trips	HOV2+: 2.385 persons/vehicle

  In addition to manipulating the output matrices from mode choice, it is necessary to bring in vehicle trip tables produced outside of the mode choice process. These vehicle trip tables are:

  - External Through – This matrix consists of trips that pass through the study area without stopping and hence are exogenous to the travel model. The trips were estimated from the 1991 external travel survey, 2000 Census Journey to Work data, and traffic counts.

- Taxi – The taxi vehicle trip table was originally developed from a 1993 survey and has since been revised several times based upon a factoring process.
- Logan Airport SOV and HOV – This trip table is developed from a separate Logan Airport Passenger Mode Choice Model, which was developed based on a 2007 Massachusetts Port Authority survey.
- Drive-Access-Transit Auto Access – DAT trips are determined through the station choice model, which is a part of the mode choice process. Each DAT trip requires a vehicle access trip.
- Interregional SOV and HOV – The interregional vehicle trip tables are generated through the interregional trip distribution model.
- Pick-Up/Drop-Off SOV and HOV – The pick-up/drop-off (PUDO) tables, produced by the interregional trip distribution model, cover those trips in which a person is dropped off at his or her destination (not an intermediate parking lot).

- **Volume-delay function**

  The function used in the highway assignment procedure is a volume-delay function, which, when applied in the context of a highway assignment, changes the speeds users of the network experience based upon the volumes on the network. The volume-delay function employed in the CTPS regional model is a variation on the so-called Bureau of Public Roads (BPR) function. Developed by its now defunct namesake, the BPR function is a widely used and validated volume-delay function that is parabolic in shape and takes the form:

  $$\text{Congested Speed} = (\text{Free-Flow Speed})/(1 + [\text{Volume/Capacity}]^4)$$

  The CTPS regional model is segmented by time periods. For each time period, the BPR function is altered to reflect the number of hours in that period.

- **Highway network**

  The highway network is an abstract digital representation of the real highway network in eastern Massachusetts. For future-year scenarios, the highway network depicts roadway links that are planned in addition to the existing highway network. The base-year highway network is a depiction of the eastern Massachusetts highway network as it existed in the year 2007. The highway network in the base and future years includes information about number of lanes, free-flow speeds, and capacity (in vehicles per lane per hour). Freeways typically have a free-flow speed of 60 miles per hour, are three lanes, and have a capacity of 1,950 vehicles per lane per hour. Smaller arterials typically have a free-flow speed of 30 to 45 miles per hour, are coded as having one or two lanes, and have a capacity of 900 to 1,000 vehicles per lane per hour. Such parameters are consistent with widely accepted traffic engineering principles and the Transportation Research Board's *Highway Capacity Manual.*

  The highway assignment procedure performs a multi-class generalized cost equilibrium auto assignment. The multi-class assignment runs an assignment for the demand matrices of three modes, SOV, HOV, and trucks, from the total vehicle trip tables for each class,

which are assigned by time period. Tolls affect the assignment and are stored on the network.

The highway assignment procedure is iterative in that the assignment is calculated repeatedly, in order to mathematically optimize assignment results. Three criteria are used to determine how many iterations of the assignment procedure are used:

First, the relative gap is an estimate of the difference between the current assignment and a perfect equilibrium assignment, in which all paths used for a given origin-destination pair would have exactly the same time. The default relative gap is 0.5%, but CTPS employs 0.01% so that a more accurate assignment will result.

Another criterion for when to stop the iterations is the normalized gap (or trip time differential), which is the difference between the mean trip time of the current assignment and the mean minimal trip time. The mean trip time is the average trip time on the paths used in the previous iteration; the mean minimal trip time is the average trip time computed using the shortest paths of the current iteration. Again, a minimum level is selected, 0.01 minutes, in order for the designated number of iterations to be carried out.

If neither of these criteria is met, the CTPS regional model highway assignment procedure is set to stop after running through 50 iterations.

Transit Assignment Routine

The transit assignment used in EMME is a multi-path assignment based on the calculation of optimal transit strategies for system users. A transit strategy is roughly analogous to a path in highway assignment. The transit assignment allows for users of the transit system switching within the transit network between various available transit services in order to reach their destination. In basic terms, the transit assignment algorithm identifies the optimal service or services at each node in the transit network for each origin and destination node pair. This algorithm is repeated for all nodes, starting with the destination node and culminating at the origin node.

Like the highway assignment procedure, the transit assignment procedure utilizes several key inputs to estimate a transit assignment. Three of the key inputs are the transit demand matrices, the transit functions, and the transit network:

- Transit demand matrices

  The transit demand matrices are just that, matrices of trips that have been split into the transit mode because the utility of their trip suggests that transit is an attractive mode choice for their particular origin-destination pair. These trip tables come from three sources:
  - Walk-access transit trip tables from the mode choice model
  - Drive-access transit trip tables from the station choice model
  - Logan transit trip tables from the Logan Airport Passenger Mode Choice Model

- Functions

  The function used in the transit assignment procedure depicts the relative levels of attractiveness among the numerous paths available in the eastern Massachusetts transit network for each pair of TAZs. Costs are translated to time assuming a value of time of $12 per hour (using 1991 dollars) and doubling the out-of-vehicle time (walk and wait times) before adding it to in-vehicle time.

- **Transit network**

The transit network is an abstract digital representation of the real transit network in eastern Massachusetts. For future-year scenarios, the transit network depicts transit links that are planned in addition to the existing transit network. The base-year transit network is a depiction of the eastern Massachusetts transit network as it existed in the year 2009. The transit network includes every commuter rail line, rapid transit line, bus route, and ferry route in eastern Massachusetts. The bus routes run on the highway network, and their run times are influenced by roadway traffic congestion. Among other things, the transit network in the base and future years includes estimated vehicle headways, wait times, transit run times, and fares for each line. The assignment algorithm takes into consideration all of these elements in calculating a transit assignment.

Additionally, the transit network represents and accounts for park-and-ride facilities. Park-and-ride nodes provide connections between the highway and transit networks via a walk link. As a result, drive-access transit trips use both the highway and the transit networks.

The transit network also includes an extensive set of walk-access and transfer links. All these links assume a speed of 3 miles per hour.

Walk-access links are an abstract representation of all of the walking routes transit users utilize in eastern Massachusetts to access the transit system. In other words, they are an aggregate abstraction of the sidewalks, roadways, backyards, driveways, and shortcuts people use to walk to the transit system.

The walk-access estimation process is an automated process that involves three steps. The first step builds paths and distances on a walk network roadway geographic information system (GIS) coverage that is created from the most recent statewide digital line graph (DLG) coverage of the roadway network. The roadways that are unsuitable for walking within the study area are then cut from that coverage. The path building and distance skimming between transit stops and zones is calculated on this coverage. The distances between the transit stops and stations active under the scenario under study and each TAZ are then calculated from this coverage. Up to two walk links are created between each TAZ and the stations and stops on each transit line, with no links over one mile. Transfer links are created to connect all stations and stops within a quarter-mile walk.

Fare Coding

Adult CharlieTicket fares are used for coding in the EMME network. Each transit submode (boat, bus rapid transit, rapid transit, bus, commuter rail, and shuttle) is assigned a boarding fare that is placed on the walk access and transfer links serving the nodes that serve the stations and stops for that submode. Additional zone fares are represented as segment fares placed on the transit links crossing the fare zone boundaries. In addition, park-and-ride parking charges are coded onto the walk links that connect the park-and-ride nodes to the transit station and stop nodes.

Fares are translated into time for influencing path selection by assuming a value of time of $12 (in 1991 dollars) per hour. Although fares are expressed in minutes to allow them to be included in the impedances that influence path selection, they are kept separate from travel times for input into the mode choice model.

AIR QUALITY ANALYSIS

The mobile-source emissions of alternative transportation scenarios can be forecasted and analyzed using the CTPS travel demand forecasting model in conjunction with U.S. Environmental Protection Agency (EPA) emissions rates that are developed by the EPA's MOBILE software. The model estimates traffic volumes, average highway speeds, vehicle miles traveled, and vehicle hours traveled. The EPA MOBILE software develops emission factors by pollutant and speed for different years based on, among other things, assumptions about fleet fuel efficiency. Using these tools, reasonable estimates of emissions from mobile sources can be developed for various years and network conditions.

The procedure described above is used to estimate emissions from cars and trucks of carbon monoxide (CO), nitrogen oxides (NOx), volatile organic compounds (VOCs), carbon dioxide (CO_2), and particulate matter. Emissions from commuter rail diesel locomotives, transit service boats, and MBTA buses and some automobile emissions associated with park-and-ride lots are estimated off model.

In the Foxborough Commuter Rail Station Feasibility Study analysis, as in most transit studies, since the emission factors and roadway networks will remain constant between the no-build and build alternatives, the observed emission changes are due to mode shifts from auto to transit that result in lower VMT and possibly higher congested speeds on the roadway network.

APPENDIX D

SOUTH STATION MBTA & AMTRAK SCHEDULES

Franklin Line Effective May 18, 2009

Monday through Friday

Inbound to South Station

Train No.	790	702	704	706	708	732	710	734	712	714	716	718	720	794	796	798	726	728	730
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
Forge Park/495	5 05	5 45	6 15	6 35	7 00	----	7 45	----	9 03	10 45	12 05	2 05	4 00	----	5 36	7 40	8 50	10 15	11 50
Franklin/Dean College	5 10	5 52	6 22	6 42	7 07	----	7 52	----	9 10	10 52	12 12	2 12	4 07	----	5 43	7 47	8 57	10 22	11 57
Norfolk	5 19	5 59	6 29	6 49	7 14	----	7 59	----	9 17	10 59	12 19	2 19	4 14	----	f5 49	7 53	9 03	----	----
Walpole	5 25	6 05	6 35	6 55	7 21	7 54	8 05	----	9 24	11 06	12 26	2 26	4 20	----	5 56	8 00	9 09	10 33	12 08
Pimptonville	----	----	----	6 58	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Windsor Gardens	5 29	6 09	6 39	7 01	7 25	7 58	8 09	----	9 29	11 11	12 31	2 31	4 24	----	f6 01	----	----	----	----
Norwood Central	5 33	6 13	6 43	7 05	7 30	8 02	8 14	8 45	9 33	11 15	12 35	2 35	4 28	5 22	6 05	8 07	9 16	10 39	f12 14
Norwood Depot	5 36	6 16	----	7 08	----	8 05	8 17	8 47	9 35	11 17	12 37	2 37	4 31	----	f6 07	----	9 18	----	----
Islington	5 39	6 19	----	7 11	----	8 08	8 20	8 50	9 39	11 21	12 41	2 41	4 36	----	f6 11	----	9 22	----	----
Dedham Corp.Center	5 42	6 22	6 48	7 14	7 35	8 11	8 23	8 52	9 42	11 24	12 44	2 44	4 40	5 40	6 14	8 16	9 25	10 44	f12 19
Endicott	5 45	6 26	----	7 18	----	8 15	8 27	8 54	9 44	11 26	12 46	2 46	4 44	----	f6 17	----	9 27	----	----
Readville	5 48	6 29	----	7 21	----	8 19	8 31	8 59	9 47	11 29	12 49	2 49	4 48	----	----	----	----	----	----
Hyde Park	VIA	6 33	----	----	----	----	----	----	----	----	----	----	----	----	VIA	VIA	----	----	----
Ruggles	FAIR	----	7 00	7 32	7 50	----	8 44	----	9 59	11 39	12 57	----	----	----	FAIR	FAIR	----	----	----
BACK BAY	LINE	L6 45	L7 04	L7 36	L7 54	L8 35	L8 49	L9 20	L10 03	L11 43	L1 01	L3 00	L5 03	----	LINE	LINE	L9 40	L11 01	L12 36
SOUTH STATION	6 15	6 50	7 09	7 41	7 59	8 40	8 54	9 25	10 08	11 48	1 06	3 05	5 08	6 05	7 05	8 45	9 45	11 06	12 41

Outbound from South Station

Train No.	703	733	795	735	707	709	711	713	715	717	737	719	721	723	725	727	729	731
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
SOUTH STATION	4 00	6 55	7 35	7 55	9 20	10 50	12 45	2 40	3 55	4 20	4 45	5 10	5 40	6 15	7 35	8 50	10 35	11 50
BACK BAY	----	----	VIA	8 00	9 25	10 55	12 50	2 45	4 00	4 25	4 50	5 15	5 45	6 20	7 40	8 55	10 40	11 55
Ruggles	----	----	FAIR	----	----	----	12 53	2 48	4 04	4 29	4 54	5 19	5 49	6 24	7 43	8 58	10 43	11 58
Hyde Park	----	----	LINE	----	----	----	----	----	----	4 37	5 03	----	5 59	----	----	----	10 52	----
Readville	----	7 12	8 00	----	9 36	11 05	1 03	2 58	4 14	4 40	5 07	----	6 02	6 32	7 53	9 08	10 55	12 08
Endicott	----	f7 16	f8 04	8 18	9 39	11 08	1 06	3 01	4 18	----	5 11	----	6 06	6 36	7 56	9 12	11 00	12 11
Dedham Corp.Center	----	f7 19	f8 07	8 20	9 41	11 10	1 08	3 04	4 21	4 45	5 13	5 33	6 10	6 39	7 59	9 14	11 02	12 13
Islington	----	f7 22	f8 10	8 23	----	11 13	1 11	3 06	4 24	----	5 16	----	6 12	6 42	8 02	9 17	11 05	12 16
Norwood Depot	----	f7 25	f8 13	8 26	9 46	11 16	1 14	3 10	4 27	4 50	5 19	5 38	6 15	6 45	8 05	9 20	11 08	12 19
Norwood Central	L4 22	L7 32	8 16	8 29	9 49	11 19	1 17	3 13	4 31	4 54	5 22	5 41	6 18	6 48	8 08	9 23	11 10	12 21
Windsor Gardens	----	----	8 20	----	9 53	11 23	1 21	3 17	4 35	4 58	----	5 44	6 22	6 52	8 12	9 27	11 14	12 25
Pimptonville	----	----	----	----	----	----	----	----	----	----	----	5 48	----	----	----	----	----	----
Walpole	L4 28	7 42	8 24	----	9 57	11 28	1 26	3 21	4 40	5 03	----	5 52	6 28	6 57	8 17	9 31	11 18	12 29
Norfolk	----	----	8 31	----	10 05	11 34	1 32	3 28	4 47	5 10	----	6 04	6 35	7 05	8 25	9 38	11 25	12 36
Franklin/Dean College	4 40	----	8 38	----	10 10	11 42	1 40	3 36	4 55	5 18	----	6 12	6 42	7 13	8 33	9 46	11 33	12 44
Forge Park/495	4 50	----	8 45	----	10 17	11 49	1 47	3 46	5 02	5 25	----	6 19	6 49	7 20	8 40	9 53	11 40	12 51

Notes: This schedule is effective from May 18, 2009 and replaces the schedule of October 27, 2008.

Times shown in this schedule are train departure times; customers are asked to arrive at the station platform in time for a prompt departure.

Holiday service - Trains will operate on a Saturday or Sunday schedule on the holidays indicated:

Saturday service: President's Day and 4th of July (train no. 1719 may be held for 45 minutes after the conclusion of the 4th of July fireworks).

Sunday service: New Year's Day, Memorial Day, Labor Day, Thanksgiving Day and Christmas Day.

Times in red indicate an f stop - Passengers must notify the conductor that they wish to get off at these designated stations.

Passengers who wish to board at these designated stations must be on the platform in full view of the engineer.

Times in blue indicate an L stop - This is a regular stop to discharge or pick up passengers, however the train may leave ahead of schedule.

VIA FAIR - operates via the Fairmount line between Readville and South Station. See the Fairmount line schedule for all stops.

Bicycles are allowed on trains with the bicycle shown above the train number.

Shaded area indicates peak hour trains.

Saturday and Sunday

Inbound to South Station

	Saturday		Saturday and Sunday						
Train No. Saturday	1702	1704	1706	1708	1710	1712	1714	1716	1718
Train No. Sunday	SAT ONLY	SAT ONLY	2706	2708	2710	2712	2714	2716	2718
	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
Forge Park/495	6 35	8 35	10 40	12 40	2 35	4 35	6 35	8 35	10 35
Franklin/Dean College	6 42	8 42	10 47	12 47	2 42	4 42	6 42	8 42	10 42
Norfolk	6 49	8 49	10 54	12 54	2 49	4 49	6 49	8 49	10 49
Walpole	6 55	8 56	11 01	1 01	2 56	4 56	6 55	8 55	10 55
Windsor Gardens	6 59	9 00	11 06	1 06	3 01	5 01	6 59	8 59	10 59
Norwood Central	7 03	9 05	11 10	1 10	3 05	5 05	7 03	9 03	11 03
Norwood Depot	7 05	9 07	11 12	1 12	3 07	5 07	7 05	9 05	11 05
Islington	7 08	9 10	11 16	1 16	3 11	5 11	7 08	9 08	11 08
Dedham Corp. Center	7 10	9 12	11 19	1 19	3 14	5 14	7 10	9 10	11 10
Endicott	7 13	9 15	11 21	1 21	3 16	5 16	7 13	9 13	11 13
Readville	7 16	9 18	11 24	1 24	3 19	5 19	7 16	9 16	11 16
Ruggles	7 26	9 28	11 34	1 34	3 29	5 29	7 26	9 26	11 26
BACK BAY	7 30	9 33	11 38	1 38	3 33	5 33	7 30	9 30	11 30
SOUTH STATION	7 35	9 38	11 43	1 43	3 38	5 38	7 35	9 35	11 35

Outbound from South Station

	Saturday		Saturday and Sunday						
Train No. Saturday	1703	1705	1707	1709	1711	1713	1715	1717	1719
Train No. Sunday	SAT ONLY	SAT ONLY	2707	2709	2711	2713	2715	2717	2719
	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
SOUTH STATION	7 20	9 20	11 20	1 20	3 20	5 20	7 20	9 20	11 20
BACK BAY	7 25	9 25	11 25	1 25	3 25	5 25	7 25	9 25	11 25
Ruggles	7 28	9 28	11 28	1 28	3 28	5 28	7 28	9 28	11 28
Readville	7 38	9 38	11 38	1 38	3 38	5 38	7 38	9 38	11 38
Endicott	7 41	9 41	11 41	1 41	3 41	5 41	7 41	9 41	11 41
Dedham Corp. Center	7 44	9 44	11 44	1 45	3 45	5 45	7 44	9 44	11 44
Islington	7 46	9 46	11 46	1 47	3 47	5 47	7 46	9 46	11 46
Norwood Depot	7 49	9 49	11 49	1 50	3 50	5 50	7 49	9 49	11 49
Norwood Central	7 51	9 51	11 51	1 53	3 53	5 53	7 52	9 51	11 51
Windsor Gardens	7 55	9 55	11 55	1 57	3 57	5 57	7 56	9 55	11 55
Walpole	7 59	9 59	11 59	2 03	4 03	6 03	8 01	9 59	11 59
Norfolk	8 05	10 05	12 05	2 10	4 10	6 10	8 07	10 05	12 05
Franklin/Dean College	8 12	10 12	12 12	2 17	4 17	6 17	8 15	10 12	12 12
Forge Park/495	8 19	10 19	12 19	2 24	4 24	6 24	8 22	10 19	12 19

Fairmount Line Effective Monday, February 9, 2009

Monday through Friday (no service on Saturday or Sunday)

Inbound to South Station

Train No.	790	744	746	748	750	BUS	754	756	758	760	762	764	766	796	768	770	798	772
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
Readville	5 48	6 35	7 05	7 58	8 25	----	11 03	1 03	3 03	4 13	5 23	5 53	6 18	6 25	7 13	8 13	8 22	10 10
Fairmount	f 5 51	6 38	7 08	8 01	8 28	9 15	f 11 06	f 1 06	f 3 06	f 4 16	f 5 26	f 5 56	----	f 6 30	f 7 16	f 8 16	----	f 10 13
Morton Street	f 5 55	6 42	7 12	8 05	8 32	9 25	f 11 10	f 1 10	f 3 10	f 4 20	f 5 30	f 6 00	----	f 6 48	f 7 20	f 8 20	----	f 10 17
Uphams Corner	f 6 02	6 49	7 19	8 12	8 39	9 45	f 11 17	f 1 17	f 3 17	f 4 27	f 5 37	f 6 07	----	f 6 55	f 7 27	f 8 27	----	f 10 23
SOUTH STATION	6 15	7 02	7 32	8 25	8 52	10 05	11 30	1 30	3 30	4 40	5 50	6 20	6 40	7 05	7 40	8 40	8 45	10 35

Monday through Friday (no service on Saturday or Sunday)

Outbound from South Station

Train No.	743	745	747	795	749	753	755	757	759	761	763	765	767	769	771
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
SOUTH STATION	5 40	6 30	7 20	7 35	7 50	10 05	12 05	2 05	3 30	4 30	5 10	5 40	6 30	7 30	9 30
Uphams Corner	f 5 51	----	----	f 7 48	----	f 10 18	f 12 18	f 2 18	f 3 43	4 43	5 23	5 53	6 43	f 7 43	f 9 43
Morton Street	f 5 57	f 6 46	----	f 7 55	f 8 07	f 10 25	f 12 25	f 2 25	f 3 50	4 50	5 30	6 00	6 50	f 7 50	f 9 50
Fairmount	f 6 01	f 6 50	----	f 7 59	f 8 11	f 10 29	f 12 29	f 2 29	f 3 54	4 54	5 34	6 04	6 54	f 7 54	f 9 54
Readville	6 05	6 54	7 45	8 03	8 15	10 33	12 33	2 33	3 58	4 58	5 38	6 08	6 58	7 58	9 58

Notes

This schedule is effective from February 9, 2009 and replaces the schedule of Monday, April 07, 2008.

Times shown in this schedule are train departure times; customers are asked to arrive at the station platform in time for a prompt departure.

Weekend service

No service on Saturday and Sunday

Holiday service

No service on: New Years Day, Presidents Day, Memorial Day, 4th of July, Labor Day, Thanksgiving Day and Christmas Day

Bicycles are allowed on trains with the bicycle shown above the train number.

BUS will stop on Fairmount Ave. at the stairway entrance to the inbound platform, on Morton St. at the stairway entrance to the inbound platform, and on Dudley St. (Uphams Corner) at the stairway entrance to the outbound platform.

Times in red **indicate an f stop -** Passengers must notify the conductor that they wish to get off at these designated stations.

Passengers who wish to board at these designated stations must be on the platform in full view of the engineer.

Readville service is also available on **Franklin Line** trains.

Refer to the **Franklin Line** schedules for particular trains.

Shaded area indicates peak hour trains.

Providence Line

Effective May 18, 2009

MBCR

Monday through Friday

Inbound to South Station

Train No.	800	802	902	804	904	806	832	808	906	810	908	812	834	910	814	912	816	818	914	916	820	976	918	920	822	824	922	924	926	826	928	930	828	932
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
Providence	5 07	5 25	----	6 07	----	6 33	----	7 12	----	7 35	----	8 10	----	----	9 43	----	11 42	1 30	----	----	3 10	----	----	----	5 10	6 00	----	----	----	8 12	----	----	9 42	----
South Attleboro	5 17	5 35	----	6 16	----	6 42	----	7 22	----	7 45	----	8 20	----	----	9 52	----	11 52	1 42	----	----	3 25	----	----	----	5 20	6 10	----	----	----	8 23	----	----	9 52	----
Attleboro	5 27	5 45	----	6 28	----	6 52	----	7 32	----	7 55	----	8 30	9 00	----	10 02	----	12 02	1 51	----	----	3 36	----	----	----	5 29	6 18	----	----	----	8 31	----	----	10 08	----
Mansfield	5 36	5 55	----	6 38	----	7 04	7 26	7 44	----	8 05	----	8 38	9 09	----	10 10	----	12 10	1 58	----	----	3 45	----	----	----	5 38	6 26	----	----	----	8 38	----	----	10 17	----
Sharon	5 44	6 04	----	6 48	----	7 13	7 35	----	----	8 14	----	8 47	9 17	----	10 19	----	12 18	2 06	----	----	3 53	----	----	----	5 46	6 34	----	----	----	8 45	----	----	10 24	----
Stoughton	----	----	6 28	----	6 56	----	----	----	7 48	----	8 28	----	----	9 40	----	10 40	----	----	2 20	3 23	----	----	5 00	5 45	----	----	6 42	7 19	7 35	----	8 50	9 50	----	11 53
Canton Center	----	----	6 36	----	7 04	----	----	----	7 57	----	8 36	----	----	9 49	----	10 49	----	----	2 27	----	----	4 30	5 08	----	----	----	6 49	----	----	----	----	----	----	----
Canton Junction	5 51	6 11	6 39	----	7 08	----	7 41	----	8 01	8 24	8 40	8 54	9 24	9 52	10 26	10 52	12 25	----	2 30	3 33	----	4 33	5 10	----	5 53	----	6 52	----	7 45	8 52	9 00	10 00	----	f12 03
Route 128	5 56	6 16	6 44	6 58	7 14	7 24	7 47	----	8 07	8 30	8 45	8 59	9 26	9 57	10 31	10 57	12 30	2 16	----	3 38	4 04	----	5 16	----	5 58	6 47	6 57	7 33	----	8 57	9 05	----	10 35	f12 08
Hyde Park	6 01	6 21	6 49	----	7 19	----	7 52	----	8 13	8 36	8 49	9 04	----	10 02	10 36	11 02	12 35	----	2 39	3 43	----	4 38	----	----	6 04	----	7 02	----	7 54	9 02	9 10	----	10 40	----
Ruggles	6 11	6 31	----	7 10	----	----	----	----	8 23	----	----	9 14	9 41	----	10 46	11 12	12 45	2 29	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
BACK BAY	L6 15	L6 35	L6 59	L7 14	L7 28	L7 40	L8 02	L8 11	L8 27	L8 46	L8 58	L9 18	9 44	10 12	10 50	11 15	12 50	2 33	2 49	3 53	4 15	4 52	5 27	6 08	6 15	6 58	7 12	7 44	8 04	9 10	9 18	10 17	10 50	12 20
SOUTH STATION	6 20	6 40	7 04	7 19	7 33	7 45	8 07	8 16	8 32	8 51	9 03	9 23	9 49	10 17	10 55	11 20	12 55	2 38	2 54	3 58	4 20	4 57	5 32	6 13	6 20	7 03	7 17	7 49	8 09	9 15	9 23	10 22	10 55	12 25

Outbound from South Station

Train No.	901	903	801	831	905	907	833	803	909	911	805	807	913	809	915	975	811	917	813	919	815	921	817	923	819	925	821	927	823	929	825	827	931	829
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
SOUTH STATION	5 15	5 35	6 25	6 35	7 02	7 40	7 50	8 30	8 50	9 45	10 25	12 10	1 20	1 50	2 25	3 30	3 45	4 05	4 35	4 50	5 00	5 15	5 40	5 45	6 10	6 30	6 50	7 45	8 15	8 55	9 05	10 25	11 00	11 59
BACK BAY	----	5 40	6 30	6 40	7 07	7 45	7 55	8 35	8 55	9 50	10 30	12 15	1 25	1 55	2 30	3 35	3 50	4 10	4 40	4 55	5 05	5 20	5 45	5 51	6 15	6 35	6 55	7 50	8 20	9 00	9 10	10 30	11 05	12 04
Ruggles	----	----	6 33	----	----	----	7 58	8 38	----	----	----	12 18	----	1 58	2 33	3 38	3 53	4 13	4 43	4 59	5 09	5 24	5 49	5 56	6 19	6 38	6 58	7 53	8 23	9 03	9 13	10 33	11 08	12 07
Hyde Park	----	----	----	----	----	----	----	----	----	----	10 41	12 28	1 41	2 07	2 43	3 46	----	4 21	----	----	----	5 34	----	----	----	6 48	7 08	8 03	8 33	9 13	9 23	10 43	11 17	12 16
Route 128	----	5 51	6 45	----	----	7 57	8 10	8 49	9 07	----	10 46	12 34	1 47	2 13	2 49	3 52	----	4 27	4 54	5 10	----	5 40	----	6 08	6 29	----	7 13	8 08	8 38	9 18	9 28	10 48	11 22	12 21
Canton Junction	----	----	----	----	7 23	8 02	8 15	8 54	9 13	10 07	----	12 39	1 53	2 18	2 55	3 58	----	4 33	----	5 17	----	5 48	----	6 14	----	6 57	7 18	8 14	8 43	9 24	9 33	10 53	11 28	12 26
Canton Center	5 38	5 59	----	----	7 26	8 07	----	----	9 16	10 10	----	----	1 56	----	2 58	4 01	----	4 36	----	5 20	----	5 52	----	6 17	----	7 00	----	8 17	----	9 27	----	----	11 31	----
Stoughton	5 46	6 10	----	----	7 34	8 15	----	----	9 24	10 18	----	----	2 04	----	3 06	----	----	4 45	----	5 30	----	6 01	----	6 26	----	7 09	----	8 26	----	9 35	----	----	11 39	----
Sharon	----	----	6 54	----	----	----	----	9 00	----	----	10 57	12 45	----	2 24	----	----	4 12	----	5 05	----	5 27	----	6 07	----	6 37	----	7 24	----	8 49	----	9 39	10 59	----	12 31
Mansfield	----	----	7 01	7 08	----	----	8 28	9 08	----	----	11 05	12 53	----	2 32	----	----	4 21	----	5 14	----	5 36	----	6 18	----	6 46	----	7 33	----	8 57	----	9 47	11 07	----	12 39
Attleboro	----	----	7 10	----	----	----	8 37	9 15	----	----	11 14	1 01	----	2 40	----	----	4 31	----	5 24	----	5 49	----	6 26	----	6 55	----	7 42	----	9 05	----	9 55	11 15	----	12 48
South Attleboro	----	----	7 16	----	----	----	----	9 21	----	----	11 21	1 08	----	2 50	----	----	4 37	----	5 33	----	5 57	----	6 33	----	7 02	----	7 49	----	9 12	----	10 02	11 22	----	12 56
Providence	----	----	7 25	----	----	----	----	9 30	----	----	11 30	1 17	----	2 59	----	----	4 46	----	5 42	----	6 06	----	6 42	----	7 11	----	7 58	----	9 21	----	10 11	11 32	----	1 06

Saturday and Sunday

Inbound to South Station

Train No. Saturday / Train No. Sunday	1802 SAT ONLY	1804 SAT ONLY	1806 2806	1808 2808	1810 2810	1812 2812	1814 2814	1816 2816	1818 SAT ONLY	SUN ONLY 2818
	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
Providence	6 35	8 35	11 20	12 55	2 56	4 56	7 05	8 52	10 00	10 10
South Attleboro	6 45	8 45	11 30	1 05	3 06	5 06	7 15	9 02	10 10	10 20
Attleboro	6 53	8 53	11 38	1 13	3 14	5 14	7 23	9 10	10 18	10 28
Mansfield	7 00	9 00	11 45	1 20	3 24	5 24	7 30	9 20	10 25	10 35
Sharon	7 08	9 08	11 53	1 28	3 32	5 32	7 38	9 28	10 33	10 43
Canton Junction	7 15	9 15	12 00	1 35	3 39	5 39	7 45	9 35	10 40	10 50
Route 128	7 20	9 20	12 05	1 40	3 44	5 44	7 50	9 40	10 45	10 55
Hyde Park	7 25	9 25	12 10	1 45	3 49	5 49	7 55	9 45	10 50	11 00
Ruggles	7 35	9 35	12 22	1 55	3 59	5 59	8 00	9 55	11 00	11 10
BACK BAY	7 38	9 38	12 25	1 58	4 02	6 02	8 08	9 58	11 03	11 13
SOUTH STATION	7 43	9 43	12 30	2 03	4 07	6 07	8 13	10 03	11 08	11 18

Outbound from South Station

Train No. Saturday / Train No. Sunday	1801 SAT ONLY	1803 SAT ONLY	1805 2805	1807 2807	1809 2809	1811 SAT ONLY	SUN ONLY 2811	1813 2813	1815 2815	1817 2817
	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
SOUTH STATION	6 45	10 05	11 05	1 05	2 25	4 45	4 40	6 45	8 45	11 10
BACK BAY	6 50	10 10	11 10	1 10	2 30	4 50	4 45	6 50	8 50	11 15
Ruggles	6 53	10 13	11 13	1 13	2 33	4 53	4 48	6 53	8 53	11 18
Hyde Park	7 01	10 21	11 21	1 21	2 41	5 01	4 56	7 01	9 01	11 26
Route 128	7 06	10 26	11 28	1 28	2 46	5 06	5 01	7 06	9 06	11 31
Canton Junction	7 11	10 31	11 33	1 33	2 51	5 11	5 06	7 11	9 11	11 36
Sharon	7 16	10 36	11 38	1 38	2 56	5 16	5 11	7 16	9 16	11 41
Mansfield	7 24	10 44	11 46	1 46	3 04	5 24	5 19	7 24	9 24	11 49
Attleboro	7 31	10 51	11 53	1 53	3 11	5 31	5 26	7 31	9 31	11 56
South Attleboro	7 40	11 00	12 02	2 02	3 20	5 40	5 35	7 40	9 40	12 05
Providence	7 50	11 10	12 12	2 12	3 30	5 50	5 45	7 50	9 50	12 15

Times in red indicate an f stop - Passengers must notify the conductor that they wish to get off at these designated stations. Passengers who wish to board at these designated stations must be on the platform in full view of the engineer.

Times in blue indicate an L stop - This is a regular stop to discharge or pick up passengers, however the train may leave ahead of schedule.

Bicycles are allowed on trains with the bicycle symbol shown above the train number.

For additional service to Ruggles refer to the Needham Line and Franklin Line schedules for particular trains.

For additional service to Hyde Park refer to the Franklin Line schedule for particular trains.

Shaded area indicates peak hour trains.

Notes: This schedule is effective from Monday, May 18, 2009 and replaces the schedule of October 27, 2008.

Times shown in this schedule are train departure times; customers are asked to arrive at the station platform in time for a prompt departure.

Holiday service:
Trains will operate on a Saturday or Sunday schedule on the holidays indicated below:

Saturday service:
President's Day and 4th of July (train number 1817 may be held for 45 minutes after the conclusion of the 4th of July fireworks).

Sunday service:
New Year's Day, Memorial Day, Labor Day, Thanksgiving Dayand Christmas Day.

All other holidays:
Regular service is provided on all other holidays. Consult 'Transit Updates' at **www.mbta.com** or call Customer Service at **617-222-3200** for any extra service that may be provided.

Worcester Line Effective May 18, 2009

MBCR

Monday through Friday

Inbound to South Station

Train No.	P500	P502	P504	P506	P508	P510	P512	P514	P516	P518	P520	P522	P524	P526	P528	P530	P532	P534	P536	P538	P540
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	A.M.	A.M.
Worcester/Union Station	4 45	5 40	6 05	6 30	6 55	----	7 35	----	8 30	10 30	----	----	2 05	4 30	----	5 35	----	----	7 46	----	12 10
Grafton	5 00	5 54	6 19	6 44	7 09	----	7 49	----	8 43	10 43	----	----	2 18	4 43	----	5 48	----	----	7 59	----	f12 22
Westborough	5 06	5 59	6 24	6 49	7 14	----	7 54	----	8 47	10 47	----	----	2 22	4 47	----	5 52	----	----	8 03	----	f12 26
Southborough	5 16	6 08	6 33	6 58	7 23	----	8 03	----	8 56	10 56	----	----	2 31	4 56	----	6 01	----	----	8 12	----	f12 34
Ashland	5 23	6 13	6 38	7 03	7 28	----	8 08	----	9 00	11 00	----	----	2 35	5 00	----	6 05	----	----	8 16	----	f12 38
Framingham	5 35	6 25	6 50	7 15	7 40	8 00	8 19	8 40	9 11	11 11	12 20	2 09	2 46	5 11	5 40	6 16	6 43	7 45	8 27	12 31	f12 48
West Natick	5 40	6 31	6 55	7 20	7 46	8 05	8 24	8 45	9 16	11 16	12 25	2 14	2 51	5 16	5 45	6 21	6 48	7 50	----	f12 36	----
Natick	5 45	----	7 00	7 25	7 51	8 10	8 29	8 50	9 21	11 21	12 30	2 19	2 56	5 21	5 50	6 26	6 53	7 55	----	f12 40	----
Wellesley Square	5 51	----	7 06	7 31	----	8 16	8 35	8 56	9 27	11 27	12 35	2 24	3 02	5 27	5 56	6 32	6 59	8 01	----	f12 45	----
Wellesley Hills	5 55	----	7 10	7 35	----	8 20	8 39	9 00	9 31	11 31	12 39	2 28	3 06	5 31	6 00	6 36	7 03	8 05	----	f12 48	----
Wellesley Farms	5 58	----	7 13	7 38	----	8 23	8 42	9 03	9 34	11 34	12 42	2 31	3 09	5 34	6 03	6 39	7 06	8 08	----	f12 51	----
Auburndale	6 03	----	7 18	7 43	----	8 28	----	9 08	----	11 39	12 47	2 36	----	----	----	----	----	----	----	f12 55	----
West Newton	6 06	----	7 21	7 46	----	8 31	----	9 11	----	11 42	12 50	2 39	----	----	----	----	----	----	----	f12 58	----
Newtonville	6 10	----	7 25	7 50	----	8 35	----	9 15	----	11 45	12 53	2 42	----	----	----	----	----	----	----	f1 01	----
Yawkey	L6 20	L6 57	L7 35	L8 00	----	L8 45	----	----	----	----	L1 04	L2 52	----	----	****	L6 58	----	----	----	----	----
BACK BAY	L6 25	L7 02	L7 40	L8 05	L8 17	L8 50	L9 02	L9 29	L9 54	L11 59	L1 09	L2 57	L3 29	L5 59	L6 24	L7 03	L7 26	L8 28	L8 56	L1 17	L1 24
SOUTH STATION	6 31	7 08	7 46	8 11	8 23	8 56	9 08	9 35	10 00	12 05	1 15	3 03	3 35	6 05	6 30	7 09	7 32	8 34	9 02	1 23	1 30

Outbound from South Station

**** Train P528 only stops at Yawkey Station at 6 19pm on weekday evenings when Red Sox home games are scheduled.

Train No.	P501	P503	P505	P507	P509	P511	P513	P515	P517	P519	P521	P523	P525	P527	P529	P531	P533	P535	P537	P539
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
SOUTH STATION	4 00	6 50	6 59	7 29	8 50	11 00	12 10	1 00	2 40	4 05	4 27	5 00	5 15	5 35	6 15	6 30	7 15	8 20	10 20	11 25
BACK BAY	4 06	6 56	7 05	7 35	8 56	11 06	12 16	1 06	2 46	4 11	4 33	5 06	5 21	5 41	6 21	6 36	7 21	8 26	10 26	11 31
Yawkey	----	----	----	----	----	11 11	----	----	----	----	4 38	----	5 26	5 46	----	6 41	7 26	8 31	10 31	11 36
Newtonville	----	----	----	----	----	11 20	12 28	1 18	2 58	----	4 48	----	5 36	5 56	----	6 50	7 35	8 40	10 40	11 45
West Newton	----	----	----	----	----	11 24	12 32	1 21	3 01	----	4 52	----	5 40	6 00	----	6 54	7 39	8 44	10 44	11 49
Auburndale	----	----	----	----	----	11 27	12 35	1 24	3 04	----	4 55	----	5 43	6 03	----	6 57	7 42	8 47	10 47	11 52
Wellesley Farms	----	----	----	----	9 12	11 32	12 40	1 29	3 09	----	5 00	----	5 48	6 08	----	7 02	7 47	8 52	10 52	11 57
Wellesley Hills	----	----	7 24	7 55	9 15	11 35	12 43	1 32	3 12	----	5 03	----	5 51	6 11	----	7 05	7 50	8 55	10 55	12 00
Wellesley Square	----	L7 16	7 28	7 59	9 19	11 39	12 47	1 36	3 16	----	5 07	----	5 55	6 15	----	7 09	7 54	8 59	10 59	12 04
Natick	----	----	7 34	8 05	9 25	11 45	12 53	1 42	3 22	----	5 13	----	6 01	6 21	----	7 15	8 00	9 05	11 05	12 10
West Natick	----	7 25	L7 39	L8 10	9 30	L11 51	12 58	L1 47	3 27	4 36	L5 19	5 31	L 6 07	6 26	6 46	L7 22	8 06	9 11	11 11	L12 16
Framingham	4 40	7 30	7 45	8 16	9 35	11 57	1 03	1 53	3 33	4 42	5 25	5 37	6 13	6 31	6 52	7 28	8 11	9 16	11 16	12 21
Ashland	----	7 37	----	----	9 41	----	1 09	----	3 39	4 48	----	5 43	----	6 38	6 58	----	8 18	9 22	11 22	----
Southborough	----	7 42	----	----	9 46	----	1 14	----	3 44	4 53	----	5 48	----	6 43	7 03	----	8 23	9 27	11 27	----
Westborough	----	7 51	----	----	9 55	----	1 22	----	3 53	5 03	----	5 58	----	6 52	7 13	----	8 32	9 36	11 36	----
Grafton	L5 00	L7 59	----	----	L10 02	----	L1 27	----	L3 59	L5 09	----	L6 05	----	L6 58	L7 19	----	L8 38	L9 42	L11 42	----
Worcester/Union Station	5 19	8 14	----	----	10 16	----	1 41	----	4 13	5 24	----	6 20	----	7 13	7 34	----	8 52	9 56	11 56	----

Notes: This schedule is effective from Monday, May 18, 2009 and replaces the schedule of October 27, 2008.

Holiday service
Trains will operate on a Saturday or Sunday schedule on the holidays indicated below:

Saturday service
President's Day and 4th of July (train number P567 may be held for 45 minutes after the conclusion of the 4th of July fireworks).

Sunday service
New Year's Day, Memorial Day, Labor Day, Thanksgiving Day and Christmas Day.

All other holidays
Regular service is provided on all other holidays. Consult 'Transit Updates' at **www.mbta.com** or call Customer Service at **617-222-3200** for any extra service that may be provided.

Times in red indicate an f stop - Passengers must notify the conductor that they wish to get off at these designated stations.
Passengers who wish to board at these designated stations must be on the platform in full view of the engineer.

Times in blue indicate an L stop - This is a regular stop to discharge or pick up passengers, however the train may leave ahead of schedule.

Bicycles are allowed on trains with the bicycle symbol shown above the train number.

Shaded area indicates peak hour trains.

Saturday and Sunday

Inbound to South Station

Train No. Saturday / Train No. Sunday	P550 / SAT ONLY	P552 / P552	P554 / P554	P556 / P556	P558 / P558	P560 / P560	P562 / P562	P564 / P564	P566 / P566
	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	A.M.
Worcester/Union Station	----	9 25	----	2 35	----	6 20	8 00	----	12 50
Grafton	----	9 38	----	2 48	----	6 33	8 13	----	f1 03
Westborough	----	9 42	----	2 52	----	6 37	8 17	----	f1 07
Southborough	----	9 50	----	3 00	----	6 45	8 25	----	f1 15
Ashland	----	9 55	----	3 05	----	6 50	8 30	----	f1 19
Framingham	8 15	10 05	11 50	3 15	3 35	7 00	8 40	9 45	f1 29
West Natick	8 19	10 09	11 54	3 19	3 39	7 04	8 44	9 49	f1 33
Natick	8 24	10 14	11 59	3 24	3 44	7 09	8 49	9 54	f1 38
Wellesley Square	8 29	10 19	12 04	3 29	3 49	7 14	8 54	9 59	f1 43
Wellesley Hills	8 32	10 23	12 07	3 32	3 52	7 18	8 57	10 02	f1 46
Wellesley Farms	8 35	10 26	12 10	3 35	3 55	7 21	9 00	10 05	f1 49
Auburndale	8 40	10 31	12 15	3 40	4 00	7 26	9 05	10 10	f1 54
West Newton	8 43	10 34	12 18	3 43	4 03	7 29	9 08	10 13	f1 57
Newtonville	8 46	10 37	12 21	3 46	4 06	7 32	9 11	10 16	f2 00
Yawkey	----	L10 49	L12 31	----	L4 16	L7 42	----	----	----
BACK BAY	L8 59	L10 54	L12 37	L3 59	L4 22	L7 46	L9 24	L10 28	L2 10
SOUTH STATION	9 05	11 00	12 43	4 05	4 28	7 52	9 30	10 34	2 16

Outbound from South Station

Train No. Saturday / Train No. Sunday	P551 / SAT ONLY	P553 / P553	P555 / P555	P557 / P557	P559 / P559	P561 / P561	P563 / P563	P565 / P565	P567 / P567
	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
SOUTH STATION	7 00	7 40	10 45	12 45	2 30	4 30	6 00	8 35	11 00
BACK BAY	7 06	7 46	10 51	12 51	2 36	4 36	6 06	8 41	11 06
Yawkey	----	----	----	12 56	----	4 41	6 10	----	11 10
Newtonville	7 17	7 57	11 02	1 04	2 47	4 49	6 18	8 52	11 18
West Newton	7 20	8 00	11 05	1 07	2 50	4 52	6 21	8 55	11 21
Auburndale	7 23	8 03	11 08	1 10	2 53	4 55	6 24	8 58	11 24
Wellesley Farms	7 28	8 08	11 13	1 15	2 58	5 00	6 29	9 03	11 29
Wellesley Hills	7 31	8 11	11 16	1 18	3 01	5 03	6 32	9 06	11 32
Wellesley Square	7 34	8 14	11 19	1 21	3 04	5 06	6 35	9 09	11 35
Natick	7 39	8 19	11 24	1 26	3 09	5 11	6 40	9 14	11 40
West Natick	L7 45	8 25	L11 30	1 32	L3 15	5 17	6 46	L9 20	11 46
Framingham	7 51	8 30	11 37	1 37	3 21	5 22	6 51	9 26	11 51
Ashland	----	8 36	----	1 43	----	5 28	6 57	----	11 57
Southborough	----	8 40	----	1 47	----	5 32	7 02	----	12 01
Westborough	----	8 49	----	1 56	----	5 41	7 11	----	12 10
Grafton	----	L8 54	----	L2 02	----	L5 47	L7 16	----	L12 15
Worcester/Union Station	----	9 09	----	2 17	----	6 02	7 31	----	12 30

Needham Line Effective May 18, 2009

MBCR

Monday through Friday

Inbound to South Station

Train No.	600	602	604	606	608	610	612	614	616	618	620	622	626	628	630	632
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
Needham Heights	6 10	6 45	7 30	8 02	8 30	9 35	10 55	12 55	3 05	3 50	5 00	5 35	7 18	8 00	9 00	10 10
Needham Center	6 14	6 49	7 34	8 06	8 34	9 39	10 59	12 59	3 09	3 54	5 04	5 39	7 22	8 04	9 04	10 14
Needham Junction	6 18	6 53	7 38	8 10	8 38	9 43	11 03	1 03	3 13	3 58	5 08	5 43	7 26	8 08	9 08	10 18
Hersey	6 21	6 56	7 42	8 13	8 41	9 46	11 06	1 06	3 16	4 01	5 15	5 46	7 29	8 11	9 11	10 21
West Roxbury	6 25	7 01	7 47	8 18	8 46	9 51	11 11	1 11	3 28	4 06	5 20	5 53	7 39	8 16	9 16	10 26
Highland	6 28	7 05	7 50	8 20	8 49	9 53	11 13	1 13	3 30	4 08	5 22	----	7 41	----	9 18	10 28
Bellevue	6 31	7 08	7 53	8 22	8 52	9 56	11 15	1 15	3 32	4 10	5 24	----	7 43	----	9 20	10 30
Roslindale Village	6 34	7 12	7 57	8 25	8 55	9 59	11 17	1 17	3 34	4 13	5 26	----	7 45	----	9 22	10 32
Forest Hills	6 37	7 15	8 00	8 28	8 58	10 02	11 20	1 20	3 37	L4 15	L5 29	L6 04	7 48	8 23	9 25	10 35
Ruggles	6 41	7 20	8 05	8 33	9 04	10 07	11 24	1 24	----	----	----	----	7 52	8 27	9 29	10 39
BACK BAY	L6 45	L7 24	L8 09	L8 37	L9 08	10 11	11 28	1 28	3 45	4 22	L5 37	L6 12	7 56	8 31	9 33	10 42
SOUTH STATION	6 50	7 29	8 14	8 42	9 13	10 16	11 33	1 33	3 50	4 27	5 50	6 17	8 01	8 36	9 38	10 47

Outbound from South Station

Train No.	605	607	609	611	613	615	617	619	621	623	625	627	629	631	633	635
	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
SOUTH STATION	7 05	7 25	8 40	10 00	12 00	2 00	3 00	4 00	4 40	5 20	5 55	6 25	7 10	8 10	9 15	10 30
BACK BAY	7 10	7 30	8 45	10 05	12 05	2 05	3 05	4 05	4 45	5 25	6 00	6 30	7 15	8 15	9 20	10 35
Ruggles	----	----	----	----	12 08	2 08	3 08	4 08	4 49	5 29	6 04	6 34	7 19	8 18	9 23	10 38
Forest Hills	7 16	7 36	----	10 12	12 13	2 14	3 13	4 13	4 54	5 34	6 09	6 39	7 24	8 23	9 28	10 43
Roslindale Village	7 20	----	8 59	10 15	12 16	2 18	3 16	4 16	4 57	5 37	6 12	6 42	7 27	8 26	9 31	10 46
Bellevue	7 22	----	9 01	10 17	12 18	2 21	3 18	4 19	5 00	5 40	6 15	6 45	7 30	8 29	9 34	10 49
Highland	7 24	----	9 03	10 19	12 20	2 23	3 20	4 21	5 03	5 43	6 18	6 47	7 32	8 31	9 36	10 51
West Roxbury	7 26	7 42	9 05	10 21	12 22	2 27	3 22	4 23	5 06	5 49	6 21	6 49	7 34	8 33	9 38	10 53
Hersey	7 32	7 54	9 10	10 27	12 27	2 32	3 27	4 28	5 11	5 54	6 26	6 54	7 39	8 38	9 43	10 58
Needham Junction	7 42	8 12	9 13	10 30	12 30	2 35	3 30	4 31	5 14	5 58	6 29	6 57	7 42	8 41	9 46	11 01
Needham Center	7 46	8 16	9 17	10 34	12 34	2 39	3 34	4 35	5 18	6 02	6 33	7 01	7 46	8 45	9 50	11 05
Needham Heights	7 50	8 20	9 21	10 38	12 38	2 43	3 38	4 40	5 22	6 06	6 37	7 05	7 50	8 49	9 54	11 09

Notes: This schedule is effective from May 18, 2009 and replaces the schedule of October 27, 2008.

Times shown in this schedule are train departure times; customers are asked to arrive at the station platform in time for a prompt departure.

Holiday service - Trains will operate on a Saturday or Sunday schedule on the holidays indicated below:

Saturday service: President's Day and 4th of July (train no. 1617 may be held for 45 minutes after the conclusion of the 4th of July fireworks).

Sunday service: There is no service on New Year's Day, Memorial Day, Labor Day, Thanksgiving Day and Christmas Day.

Times in blue indicate an L stop - This is a regular stop to discharge or pick up passengers, however the train may leave ahead of schedule.

Bicycles are allowed on trains with the bicycle shown above the train number.

Shaded area indicates peak hour trains.

Saturday (no service Sunday)

Inbound to South Station

Train No.	1602	1604	1606	1608	1610	1612	1614	1616	1618
	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
Needham Heights	7 58	9 58	11 58	1 58	3 58	5 58	7 58	9 58	11 32
Needham Center	8 02	10 02	12 02	2 02	4 02	6 02	8 02	10 02	----
Needham Junction	8 06	10 06	12 06	2 06	4 06	6 06	8 06	10 06	----
Hersey	8 09	10 09	12 09	2 09	4 09	6 09	8 09	10 09	----
West Roxbury	8 14	10 14	12 14	2 14	4 14	6 14	8 14	10 14	----
Highland	8 16	10 16	12 16	2 16	4 16	6 16	8 16	10 16	----
Bellevue	8 18	10 18	12 18	2 18	4 18	6 18	8 18	10 18	----
Roslindale Village	8 20	10 20	12 20	2 20	4 20	6 20	8 20	10 20	----
Forest Hills	8 23	10 23	12 23	2 23	4 23	6 23	8 23	10 23	----
Ruggles	8 27	10 27	12 27	2 27	4 27	6 27	8 27	10 27	----
BACK BAY	8 31	10 31	12 31	2 31	4 31	6 31	8 31	10 31	----
SOUTH STATION	8 36	10 36	12 36	2 36	4 36	6 36	8 36	10 36	11 57

Outbound from South Station

Train No.	1601	1603	1605	1607	1609	1611	1613	1615	1617
	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
SOUTH STATION	7 10	9 10	11 10	1 10	3 10	5 10	7 10	9 10	10 45
Back Bay	7 15	9 15	11 15	1 15	3 15	5 15	7 15	9 15	10 50
Ruggles	7 18	9 18	11 18	1 18	3 18	5 18	7 18	9 18	10 53
Forest Hills	7 22	9 22	11 22	1 22	3 22	5 22	7 22	9 22	10 57
Roslindale Village	7 25	9 25	11 25	1 25	3 25	5 25	7 25	9 25	11 00
Bellevue	7 27	9 27	11 27	1 27	3 27	5 27	7 27	9 27	11 02
Highland	7 29	9 29	11 29	1 29	3 29	5 29	7 29	9 29	11 04
West Roxbury	7 31	9 31	11 31	1 31	3 31	5 31	7 31	9 31	11 06
Hersey	7 36	9 36	11 36	1 36	3 36	5 36	7 36	9 36	11 11
Needham Junction	7 39	9 39	11 39	1 39	3 39	5 39	7 39	9 39	11 14
Needham Center	7 43	9 43	11 43	1 43	3 43	5 43	7 43	9 43	11 18
Needham Heights	7 47	9 47	11 47	1 47	3 47	5 47	7 47	9 47	11 22

Old Colony Line Effective May 18, 2009

MBCR

Monday through Friday

Inbound to South Station

Train No.	002 A.M.	032 A.M.	004 A.M.	034 A.M.	006 A.M.	036 A.M.	008 A.M.	038 A.M.	010 A.M.	040 A.M.	012 A.M.	060 A.M.	042 A.M.	014 A.M.	062 P.M.	016 P.M.	044 P.M.	064 P.M.	018 P.M.	048 P.M.	020 P.M.	022 P.M.	052 P.M.	054 P.M.	056 P.M.	028 P.M.
Plymouth	----	----	----	----	----	----	----	----	----	----	----	10 13	----	----	12 06	----	----	2 28	----	----	----	----	----	7 45*	----	----
Kingston	----	5 32	----	6 19	----	7 11	----	7 37	----	8 37	----	----	10 48	----	----	----	1 16	----	4 02	----	----	----	6 27	7 23*	8 53	----
Halifax	----	5 42	----	6 29	----	7 21	----	7 47	----	8 47	----	10 23	10 58	----	12 16	----	1 26	2 38	----	4 12	----	----	6 40	7 55	9 03	----
Hanson	----	5 47	----	6 34	----	7 26	----	7 52	----	8 52	----	10 29	11 03	----	12 21	----	1 31	2 43	----	4 17	----	----	6 45	8 00	9 08	----
Whitman	----	5 52	----	6 39	----	7 31	----	7 57	----	8 57	----	10 34	11 08	----	12 26	----	1 36	2 48	----	4 22	----	----	6 55	8 08	9 13	----
Abington	----	5 56	----	6 43	----	7 35	----	8 01	----	9 01	----	10 38	11 12	----	12 30	----	1 39	2 52	----	4 26	----	----	6 58	8 12	9 17	----
South Weymouth	----	6 01	----	6 49	----	7 42	----	8 06	----	9 06	----	10 43	11 20	----	12 37	----	1 47	2 57	----	4 31	----	----	7 03	8 17	9 22	----
Middleborough/Lakeville	5 20	----	6 00	----	6 58	----	7 20	----	8 07	----	9 38	----	----	11 10	----	1 08	----	----	3 25	----	4 54	6 05	----	----	----	9 25
Bridgewater	5 30	----	6 10	----	7 08	----	7 30	----	8 17	----	9 48	----	----	11 20	----	1 18	----	----	3 35	----	5 04	6 20	----	----	----	9 35
Campello	5 37	----	6 18	----	7 16	----	7 38	----	8 25	----	9 56	----	----	11 28	----	1 26	----	----	3 43	----	f5 11	f 6 28	----	----	----	9 42
Brockton	5 41	----	6 22	----	7 20	----	7 42	----	8 29	----	10 00	----	----	11 32	----	1 30	----	----	3 47	----	f5 15	f 6 33	----	----	----	9 46
Montello	5 44	----	6 25	----	7 23	----	7 45	----	8 32	----	10 03	----	----	11 35	----	1 33	----	----	3 50	----	f5 18	f 6 37	----	----	----	9 49
Holbrook/Randolph	5 49	----	6 30	----	7 28	----	7 50	----	8 37	----	10 08	----	----	11 40	----	1 38	----	----	3 55	----	5 23	f 6 42	----	----	----	9 54
Braintree	L5 56	----	----	L6 57	----	L7 50	----	L8 14	L8 44	L9 14	----	L10 51	L11 27	----	L12 44	L1 44	L1 54	L3 05	L4 03	L4 38	L5 31	f6 48	L7 11	L8 25	L9 29	L10 00
Quincy Center	----	----	L6 42	----	L7 39	----	L8 01	----	----	----	L10 20	----	----	L11 51	----	L1 49	----	----	----	----	----	----	----	----	----	L10 05
JFK/UMASS	L6 10	L6 21	----	----	L7 48	L8 03	L8 11	L8 28	L8 58	L9 27	----	----	----	----	L12 57	----	----	----	----	----	----	----	----	----	----	----
SOUTH STATION	6 17	6 29	6 58	7 17	7 56	8 10	8 18	8 35	9 05	9 34	10 36	11 11	11 46	12 07	1 04	2 06	2 14	3 26	4 24	4 59	6 06	7 15	7 28	8 45	9 49	10 22

Outbound from South Station

Train No.	003 A.M.	033 A.M.	005 A.M.	061 A.M.	035 A.M.	007 A.M.	063 A.M.	009 A.M.	039 P.M.	065 P.M.	015 P.M.	041 P.M.	017 P.M.	043 P.M.	019 P.M.	045 P.M.	021 P.M.	047 P.M.	023 P.M.	049 P.M.	025 P.M.	051 P.M.	027 P.M.	055 P.M.	029 P.M.	057 P.M.
SOUTH STATION	6 35	7 11	8 24	8 56	9 37	9 57	10 50	11 57	12 08	1 18	2 10	2 47	3 43	4 20	4 40	5 00	5 12	5 38	5 57	6 15	6 52	7 29	8 07	9 30	10 30	10 40
JFK/UMASS	----	----	----	----	----	----	----	----	----	----	----	2 53	3 49	4 26	----	5 06	----	----	6 03	----	----	----	8 13	9 36	----	10 46
Quincy Center	L6 49	----	----	9 09	----	10 10	----	12 10	----	----	2 23	----	3 57	----	4 53	----	5 25	5 51	6 11	----	7 05	----	8 21	----	10 43	----
Braintree	L6 55	L7 32	L8 43	9 15	9 55	----	11 08	----	12 26	1 36	----	3 07	----	4 40	----	5 19	----	5 57	----	6 33	----	7 47	----	9 48	----	10 59
Holbrook/Randolph	f7 03	----	8 51	----	----	10 22	----	12 23	----	----	2 36	----	4 10	----	5 06	----	5 37	----	6 23	----	7 17	----	8 34	----	10 56	----
Montello	f7 08	----	8 56	----	----	10 27	----	12 28	----	----	2 41	----	4 15	----	5 11	----	5 42	----	6 28	----	7 22	----	8 39	----	11 01	----
Brockton	f7 12	----	8 59	----	----	10 30	----	12 31	----	----	2 44	----	4 18	----	5 14	----	5 45	----	6 31	----	7 25	----	8 42	----	11 04	----
Campello	7 20	----	9 03	----	----	10 34	----	12 35	----	----	2 48	----	4 22	----	5 18	----	5 49	----	6 35	----	7 29	----	8 46	----	11 08	----
Bridgewater	L7 38	----	L9 11	----	----	L10 42	----	L12 43	----	----	L2 56	----	L4 30	----	L5 26	----	L5 57	----	L6 43	----	L7 37	----	L8 54	----	L11 16	----
Middleborough/Lakeville	7 50	----	9 23	----	----	10 53	----	12 55	----	----	3 10	----	4 41	----	5 38	----	6 10	----	6 55	----	7 50	----	9 05	----	11 27	----
South Weymouth	----	L7 39	----	9 22	10 02	----	11 15	----	12 33	1 43	----	3 14	----	4 47	----	5 26	----	6 04	----	6 40	----	7 54	----	9 55	----	11 06
Abington	----	7 44	----	9 27	10 07	----	11 20	----	12 39	1 48	----	3 19	----	4 52	----	5 31	----	6 09	----	6 45	----	7 59	----	10 00	----	11 11
Whitman	----	7 47	----	9 31	10 11	----	11 24	----	12 43	1 52	----	3 23	----	4 56	----	5 35	----	6 13	----	6 48	----	8 03	----	10 03	----	11 15
Hanson	----	7 57	----	9 36	10 16	----	11 29	----	12 48	1 57	----	3 28	----	5 01	----	5 40	----	6 18	----	6 53	----	8 08	----	10 08	----	11 20
Halifax	----	L8 02	----	L9 41	L10 22	----	L11 34	----	L12 53	L2 02	----	L3 33	----	L5 06	----	L5 45	----	L6 23	----	L6 58	----	L8 13	----	L10 13	----	L11 25
Kingston	----	8 12	----	----	10 34	----	----	----	1 04	----	----	3 45	----	5 18	----	5 57	----	6 35	----	7 11**	----	8 26	----	10 26	----	11 36
Plymouth	----	----	----	9 54	----	----	11 47	----	----	2 14	----	----	----	----	----	----	----	----	----	7 37**	----	----	----	----	----	----

Notes: This schedule is effective from May 18, 2009 and replaces the schedule of October 27, 2008.

Times shown in this schedule are train departure times; customers are asked to arrive at the station platform in time for a prompt departure.

Holiday service - Trains will operate on a Saturday or Sunday schedule on the holidays indicated below:

Saturday service:
President's Day and 4th of July (Train nos. 1015 and 1041 may be held for 30 minutes after the conclusion of the 4th of July fireworks).

Sunday service: New Year's Day, Memorial Day, Labor Day, Thanksgiving Day and Christmas Day.

Times in red indicate an f stop - Passengers must notify the conductor that they wish to get off at these designated stations.
Passengers who wish to board at these designated stations must be on the platform in full view of the engineer.

Times in blue indicate an L stop - This is a regular stop to discharge or pick up passengers, however the train may leave ahead of schedule.

* Train 054 stops at Plymouth after Kingston.
** Train 049 now continues to Plymouth after Kingston.

Bicycles are allowed on trains with the bicycle shown above the train number.

Shaded area indicates peak hour trains.

Saturday and Sunday

Inbound to South Station

Train no. Saturday Train no. Sunday	1002 2002 AM	1032 2032 AM	1004 2004 AM	1034 2034 AM	1052 2052 AM	1006 2006 AM	1036 2036 AM	1008 2008 PM	1054 2054 PM	1010 2010 PM	1038 2038 PM	1012 2012 PM	1056 2056 PM	1014 2014 PM	1016 2016 PM	1040 2040 PM
Plymouth	----	----	----	----	9 34	----	----	----	12 52	----	----	----	6 50	----	----	----
Kingston	----	7 00	----	8 50	10 05	----	11 30	----	1 10	----	3 35	----	6 30	----	----	9 37
Halifax	----	7 10	----	9 00	10 15	----	11 40	----	1 20	----	3 45	----	7 00	----	----	9 47
Hanson	----	7 15	----	9 05	10 20	----	11 45	----	1 25	----	3 50	----	7 05	----	----	9 52
Whitman	----	7 20	----	9 12	10 25	----	11 50	----	1 30	----	3 55	----	7 10	----	----	9 57
Abington	----	7 24	----	9 16	10 29	----	11 54	----	1 34	----	3 59	----	7 14	----	----	10 00
South Weymouth	----	7 29	----	9 21	10 37	----	11 59	----	1 39	----	4 04	----	7 19	----	----	10 05
Middleborough/Lakeville	6 50	----	8 22	----	----	10 28	----	12 43	----	1 53	----	4 06	----	7 00	9 22	----
Bridgewater	7 00	----	8 32	----	----	10 38	----	12 53	----	2 03	----	4 16	----	7 10	9 32	----
Campello	7 07	----	8 40	----	----	10 46	----	1 01	----	2 11	----	4 24	----	7 18	9 40	----
Brockton	7 11	----	8 44	----	----	10 50	----	1 05	----	2 15	----	4 28	----	7 22	9 44	----
Montello	7 14	----	8 47	----	----	10 53	----	1 08	----	2 18	----	4 31	----	7 25	9 47	----
Holbrook/Randolph	7 19	----	8 52	----	----	10 58	----	1 13	----	2 23	----	4 37	----	7 30	9 52	----
Braintree	L7 25	L7 37	----	L9 28	L10 44	L11 04	L12 06	----	L1 46	L2 29	L4 12	----	L7 26	----	----	L10 12
Quincy Center	L7 31	L7 43	L9 05	----	L10 50	L11 10	----	L1 24	L1 52	L2 36	----	L4 47	L7 32	L7 41	L10 03	L10 18
JFK/UMASS	L7 39	L7 51	L9 13	L9 41	L10 57	L11 17	L12 19	L1 32	L1 59	L2 44	L4 25	L4 55	L7 39	L7 49	L10 11	L10 25
SOUTH STATION	7 46	7 58	9 20	9 49	11 04	11 24	12 26	1 40	2 07	2 51	4 32	5 03	7 47	7 56	10 18	10 33

Outbound from South Station

Train no. Saturday Train no. Sunday	1051 2051 A.M.	1001 2001 A.M.	1033 2033 A.M.	1003 2003 A.M.	1053 2053 A.M.	1005 2005 P.M.	1035 2035 P.M.	1007 2007 P.M.	1009 2009 P.M.	1037 2037 P.M.	1055 2055 P.M.	1011 2011 P.M.	1013 2013 P.M.	1039 2039 P.M.	1015 2015 P.M.	1041 2041 P.M.
SOUTH STATION	8 30	8 40	10 05	11 20	11 47	12 34	2 00	2 10	3 35	4 10	5 25	5 40	8 10	8 20	10 35	10 45
JFK/UMASS	f8 36	f8 46	f10 11	f11 26	f11 53	f12 40	f2 06	f2 16	f3 41	f4 16	f5 31	f5 46	f8 16	f8 26	f10 41	f10 51
Quincy Center	f8 43	f8 53	f10 18	f11 33	f12 00	f12 47	f2 13	f2 24	f3 49	f4 23	f5 38	f5 54	f8 24	f8 33	f10 49	f10 58
Braintree	8 50	9 00	10 25	----	12 07	12 54	2 19	----	3 56	4 29	5 45	6 01	----	8 39	----	11 04
Holbrook/Randolph	----	9 07	----	11 47	----	1 00	----	2 37	4 02	----	----	6 07	8 36	----	11 02	----
Montello	----	9 12	----	11 52	----	1 05	----	2 42	4 07	----	----	6 12	8 41	----	11 07	----
Brockton	----	9 15	----	11 55	----	1 08	----	2 45	4 10	----	----	6 15	8 44	----	11 11	----
Campello	----	9 19	----	11 59	----	1 12	----	2 49	4 14	----	----	6 19	8 48	----	11 15	----
Bridgewater	----	L9 27	----	L12 07	----	L1 20	----	L2 57	L4 24	----	----	L6 27	L8 56	----	L11 23	----
Middleborough/Lakeville	----	9 38	----	12 18	----	1 32	----	3 10	4 34	----	----	6 38	9 08	----	11 34	----
South Weymouth	8 57	----	10 32	----	12 14	----	2 26	----	----	4 36	5 52	----	----	8 46	----	11 11
Abington	9 02	----	10 37	----	12 19	----	2 31	----	----	4 41	5 57	----	----	8 51	----	11 16
Whitman	9 06	----	10 41	----	12 23	----	2 35	----	----	4 45	6 01	----	----	8 55	----	11 20
Hanson	9 11	----	10 46	----	12 28	----	2 40	----	----	4 50	6 06	----	----	9 00	----	11 25
Halifax	L9 16	----	L10 51	----	L12 33	----	L2 45	----	----	L4 55	L6 11	----	----	L 9 05	----	L11 30
Kingston	9 46	----	11 03	----	1 03	----	2 57	----	----	5 08	6 23	----	----	9 17	----	11 42
Plymouth	9 27	----	----	----	12 45	----	----	----	----	----	6 42	----	----	----	----	----

Greenbush Line Effective Monday, October 27, 2008

Monday through Friday

Inbound to South Station

Train No.	070	072	074	076	078	080	082	084	086	088	090	092
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.
Greenbush	5 40	6 37	7 03	7 50	8 50	10 35	11 50	2 11	3 47	5 20	7 05	8 10
North Scituate	5 47	6 44	7 10	7 57	8 57	10 42	11 57	2 18	3 54	5 27	7 12	8 17
Cohasset	5 54	6 51	7 17	8 04	9 04	10 48	12 04	2 25	4 01	5 38	7 22	8 23
Nantasket Junction	5 58	6 55	7 21	8 08	9 08	10 51	12 08	2 28	4 04	5 42	7 26	8 26
West Hingham	6 03	7 00	7 26	8 13	9 13	10 56	12 13	2 33	4 09	5 47	7 31	8 31
East Weymouth	6 07	7 04	7 30	8 17	9 17	11 03	12 17	2 37	4 12	5 53	7 35	8 34
Weymouth Landing/East Braintree	6 13	7 10	7 36	8 23	9 23	11 09	12 23	2 43	4 18	5 59	7 41	8 40
Quincy Center	L 6 22	---	L 7 46	L 8 32	L 9 32	L 11 18	L 12 32	L 2 52	L 4 28	---	L 7 53	L 8 49
JFK/UMASS	L 6 30	L 7 27	---	---	---	---	---	---	---	---	---	---
SOUTH STATION	6 38	7 36	8 02	8 49	9 49	11 34	12 48	3 09	4 46	6 34	8 07	9 07

Outbound from South Station

Train No.	071	073	075	077	079	081	083	085	087	089	091	093
	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
SOUTH STATION	6 54	9 25	10 30	12 41	2 27	4 02	4 52	5 20	5 45	6 38	8 25	10 00
JFK/UMASS	---	---	---	---	---	4 08	---	5 26	---	---	---	---
Quincy Center	---	9 38	10 43	12 54	2 40	---	5 05	---	5 58	6 51	8 38	10 13
Weymouth Landing/East Braintree	L 7 17	9 47	10 52	1 03	2 49	4 24	5 14	5 42	6 07	7 00	8 47	10 22
East Weymouth	L 7 23	9 53	10 58	1 08	2 55	4 30	5 20	5 48	6 13	7 06	8 53	10 28
West Hingham	7 30	9 57	11 03	1 12	2 59	4 34	5 24	5 52	6 17	7 10	8 56	10 32
Nantasket Junction	7 34	10 02	11 07	1 17	3 04	4 39	5 29	5 57	6 22	7 15	9 00	10 37
Cohasset	7 37	10 05	11 10	1 20	3 08	4 43	5 33	6 00	6 25	7 19	9 03	10 40
North Scituate	L 7 45	L 10 13	L 11 18	L 1 28	L 3 16	L 4 51	L 5 41	L 6 08	L 6 33	L 7 27	L 9 12	L 10 48
Greenbush	7 55	10 23	11 28	1 39	3 25	4 59	5 51	6 18	6 43	7 36	9 22	10 57

Saturday and Sunday

Inbound to South Station

Train No. Saturday	1070	1072	1074	1076	1078	1080	1082	1084
Train No. Sunday	2070	2072	2074	2076	2078	2080	2082	2084
	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.
Greenbush	7 15	9 30	11 08	12 20	2 10	3 55	6 30	9 30
North Scituate	7 22	9 37	11 15	12 27	2 17	4 02	6 37	9 37
Cohasset	7 29	9 44	11 22	12 34	2 23	4 09	6 44	9 44
Nantasket Junction	7 32	9 47	11 26	12 37	2 26	4 12	6 47	9 47
West Hingham	7 37	9 52	11 31	12 42	2 31	4 17	6 52	9 52
East Weymouth	7 41	9 56	11 38	12 46	2 35	4 21	6 56	9 56
Weymouth Landing/East Braintree	7 47	10 02	11 44	12 52	2 41	4 27	7 02	10 02
Quincy Center	L 7 56	L 10 12	L 11 53	L 1 01	L 2 50	L 4 36	L 7 11	L 10 11
JFK/UMASS	L 8 04	L 10 20	L 12 01	L 1 09	L 2 59	L 4 44	L 7 19	L 10 19
SOUTH STATION	8 12	10 28	12 07	1 18	3 07	4 53	7 27	10 26

Outbound from South Station

Train No. Saturday	1071	1073	1075	1077	1079	1081	1083	1085
Train No. Sunday	2071	2073	2075	2077	2079	2081	2083	2085
	A.M.	A.M.	A.M.	P.M.	P.M.	P.M.	P.M.	P.M.
SOUTH STATION	8 05	9 45	11 03	12 55	2 45	5 10	8 00	10 55
JFK/UMASS	f 8 11	f 9 51	f 11 09	f 1 01	f 2 51	f 5 16	f 8 06	f 11 01
Quincy Center	L 8 19	L 9 59	L 11 17	L 1 09	L 2 59	L 5 24	L 8 14	L 11 09
Weymouth Landing/East Braintree	L 8 28	10 08	11 26	1 18	3 08	5 33	8 23	11 18
East Weymouth	L 8 33	10 14	11 32	1 24	3 13	5 39	8 29	11 24
West Hingham	8 37	10 18	11 36	1 28	3 17	5 43	8 33	11 28
Nantasket Junction	8 42	10 22	11 41	1 33	3 22	5 48	8 38	11 33
Cohasset	8 45	10 25	11 44	1 36	3 25	5 51	8 41	11 37
North Scituate	L 8 53	L 10 33	L 11 52	L 1 44	L 3 33	L 5 59	L 8 49	L 11 45
Greenbush	9 02	10 42	12 02	1 53	3 42	6 08	8 58	11 54

Notes

This schedule is effective from Monday, October 27, 2008 and replaces the schedule of April 7, 2008.
Times shown in this schedule are train departure times; customers are asked to arrive at the station platform in time for a prompt departure.

Holiday service - Trains will operate on a Saturday or Sunday schedule on the holidays indicated below:

Saturday service: President's Day and 4th July

Sunday service: New Year's Day, Memorial Day, Labor Day, Thanksgiving Day and Christmas Day

All other holidays: Regular service is provided on all other holidays. Consult 'Transit Updates' at **www.mbta.com** or call Customer Service at **617-222-3200** for any extra service that may be provided

Times in blue indicate an L stop. This is a regular stop to discharge or pick up passengers, however the train may leave ahead of schedule

Times in red indicate an f stop - Passengers must notify the Conductor that they wish to get off at these designated stations. Passengers who wish to board at these designated stations must be on the platform in full view of the engineer.

Monday through Friday, where no service is shown at JFK/UMASS, frequent connecting subway service is available to Quincy Center by the Red Line. For further details visit www.mbta.com

Shaded area indicates peak hour trains.

Effective **SEPTEMBER 21, 2009**

NORTHEAST CORRIDOR

BOSTON
and
NEWPORT NEWS

BOSTON - WASHINGTON
RICHMOND - NEWPORT NEWS
VIRGINIA BEACH
And intermediate stations

THIS TIMETABLE SHOWS ALL AMTRAK THROUGH SERVICE TO STATIONS BETWEEN BOSTON, MA AND NEWPORT NEWS/VIRGINIA BEACH, VA.

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National Railroad Passenger Corporation Washington Union Station, 60 Massachusetts Ave. N.E., Washington, DC 20002
NRPC Form W4–50M–9/21/09 Stock #02-3040 (Fall)

Southbound Boston • Washington • Richmond • Newport News • Virginia Beach

Train Name ▶		Northeast Regional	Palmetto	Carolinian	Acela Express	Northeast Regional	Acela Express	Northeast Regional	Northeast Regional	Acela Express	Northeast Regional	Northeast Regional	Acela Express	Northeast Regional	Northeast Regional	Acela Express	Northeast Regional	Northeast Regional	Northeast Regional	Northeast Regional	Northeast Regional	Northeast Regional	Acela Express	Acela Express
Train Number ▶		67	89	79	2151	141	2153	143	95	2155	195	147	2251	171	145	2159	99	93	83	161	85	87	2163	2253
Days of Operation ▶		Daily	Daily	Daily	Mo-Fr	Mo-Fr	Mo-Fr	SaSu	Mo-Fr	Mo-Fr	SaSu	Sa	Sa	Mo-Fr	Su	Mo-Fr	SaSu	Mo-Th	Fr	SaSu	Mo-Fr	Su	Mo-Fr	SaSu
On Board Service ▶		RB🍴Q🛍	RB🍴🛍	RB🍴🛍	RB✪🍴Q	RB🍴Q	RB✪🍴Q	RB✪🍴Q	RB🍴	RB✪🍴Q	RB🍴	RB🍴Q	RB✪🍴Q	RB🍴Q	RB🍴Q	RB✪🍴Q	RB🍴	RB🍴	RB🍴	RB🍴Q	RB✪🍴Q	RB🍴	RB✪🍴Q	RB✪🍴Q
BOSTON, MA-South Sta. (ET)	Dp	🛍 9 45P	Stops only to receive passengers New York to Washington		5 10A	From Springfield	6 10A	From Springfield	6 15A	7 15A	6 35A	From Springfield	8 10A	8 15A	From Springfield	9 15A	8 35A	9 35A	9 35A	9 35A			11 15A	11 10A
Boston, MA-Back Bay		R 9 50P			R 5 15A		R 6 15A		R 6 20A	R 7 20A	R 6 40A		R 8 15A	R 8 20A		R 9 20A	R 8 40A	R 9 40A	R 9 40A	R 9 40A			R11 20A	R11 15A
Route 128, MA		R10 00P			R 5 24A		R 6 24A		R 6 30A	R 7 29A	R 6 50A		R 8 24A	R 8 31A		R 9 29A	R 8 50A	R 9 50A	R 9 50A	R 9 50A			R11 30A	R11 24A
Providence, RI		🛍 10 25P			5 45A		6 45A		6 55A	7 50A	7 15A		8 49A	8 56A		9 50A	9 15A	10 16A	10 16A	10 15A			11 50A	11 49A
Kingston, RI (Newport 🚌) 92 94		10 46P							7 16A		7 36A			9 16A			9 36A	10 37A	10 37A	10 36A				
Westerly, RI		11 01P							7 30A		7 51A						9 51A	10 51A	10 51A					
Mystic, CT		11 12P															10 01A	11 02A	11 02A					
New London, CT (🚌 Casino)		11 25P			6 30A				7 51A		8 11A			9 49A			10 15A	11 16A	11 16A	11 09A				
Old Saybrook, CT		11 46P							8 11A		8 30A							11 36A	11 36A	11 28A				
NEW HAVEN, CT	Ar	12 20A				7 28A		8 00A	8 43A		9 03A	9 30A		10 38A	10 26A		11 08A	12 08P	12 08P	12 06P				
	Dp	🛍 12 45A			7 13A	7 38A	8 13A	8 11A	8 45A		9 11A	9 41A	10 18A	10 43A	10 41A	11 18A	11 11A	12 11P	12 11P	12 11P			1 18P	1 18P
Bridgeport, CT						7 58A		8 31A			9 31A	10 01A			11 01A		11 31A	12 31P	12 31P	12 31P				
Stamford, CT		1 31A			7 54A	8 24A		8 56A	9 28A	9 52A	9 56A	10 26A	10 57A	11 26A	11 26A	11 57A	11 56A	12 56P	12 56P	12 56P			1 57P	1 57P
New Rochelle, NY						8 47A		9 15A			10 15A	10 45A			11 45A		12 15P	1 15P	1 15P	1 15P				
NEW YORK, NY	Ar	2 20A			8 45A	9 20A	9 45A	9 50A	10 20A	10 45A	10 50A	11 20A	11 45A	12 15P	12 20P	12 45P	12 50P	1 50P	1 50P	1 50P			2 45P	2 45P
	Dp	3 00A	6 15A	7 05A	9 00A	9 35A	10 00A	10 05A	10 35A	11 00A	11 05A	12 05P	12 00N	12 35P	12 55P	1 00P	1 05P	2 05P	2 05P	2 05P	3 05P	3 06P	3 00P	3 00P
Newark, NJ		3 20A	R 6 32A	R 7 24A	9 14A	9 52A	10 14A	10 22A	10 52A	11 14A	11 22A	12 22P	12 14P	12 52P	1 12P	1 14P	1 22P	2 22P	2 22P	2 22P	3 22P	3 23P	3 14P	3 14P
Newark Liberty Intl. Air., NJ ✈						9 57A		10 27A				12 28P		12 57P			1 28P	2 27P	2 27P	2 28P		3 29P		
Metropark, NJ		3 39A				10 10A		10 41A	11 11A	11 32A	11 41A	12 42P	12 32P	1 12P		1 32P	1 43P	2 43P	2 43P	2 42P	3 40P	3 43P		3 32P
Trenton, NJ		4 06A	R 7 10A	8 05A		10 32A		11 04A	11 33A		12 05P	1 05P		1 35P	1 50P		2 05P	3 07P	3 07P	3 05P	4 03P	4 05P		
PHILADELPHIA, PA-30th St. Sta.	Ar	4 38A	R 7 37A	8 32A	10 11A	10 59A	11 11A	11 31A	12 00N	12 13P	12 32P	1 32P	1 14P	2 02P	2 17P	2 13P	2 32P	3 34P	3 34P	3 32P	4 30P	4 32P	4 08P	4 14P
Wilmington, DE	Dp	5 13A	R 8 06A	9 00A	10 32A	11 37A	11 32A	11 56A	12 25P	12 34P	12 56P	1 57P	1 35P	2 40P	2 42P	2 34P	2 57P	3 58P	3 58P	3 57P	4 57P	4 57P	4 29P	4 35P
Aberdeen, MD														3 07P						4 27P	5 24P	5 30P		
Baltimore, MD		🛍 6 11A	R 8 54A	9 46A	11 15A	12 23P	12 15P	12 46P	1 14P	1 17P	1 45P	2 45P	2 21P	3 29P	3 30P	3 17P	3 45P	4 42P	4 42P	4 50P	5 51P	5 52P	5 12P	5 21P
BWI Thurgood Marsh. Air., MD ✈		6 24A			11 27A	12 36P	12 27P	12 59P	1 29P		1 58P	2 58P	2 33P	3 43P	3 43P		3 58P	4 55P	4 55P	5 03P	6 05P	6 05P	5 24P	5 33P
New Carollton, MD		L 6 45A				D12 49P		D 1 12P	1 44P		2 14P	D 3 11P		D 3 58P	D 3 56P		4 12P	5 09P	5 09P	D 5 16P	6 20P	6 20P		
WASHINGTON, DC	Ar	7 01A	R 9 30A	10 25A	11 56A	1 05P	12 56P	1 33P	2 05P	1 52P	2 30P	3 30P	3 00P	4 15P	4 15P	3 54P	4 30P	5 25P	5 25P	5 35P	6 33P	6 35P	5 54P	6 00P
	Dp	🛍 7 30A	R 9 55A	10 55A					2 30P		2 50P						5 00P	5 50P	5 50P		7 00P	7 00P		
Alexandria, VA		🛍 7 47A	10 12A	11 12A					2 45P		3 06P						5 15P	6 07P	6 07P		7 15P	7 15P		
Franconia-Springfield, VA		7 54A																						
Woodbridge, VA									3 03P		3 24P										7 32P	7 33P		
Quantico, VA		8 16A		11 39A					3 17P		3 38P						5 45P	6 36P	6 36P		7 46P	7 47P		
Fredericksburg, VA		8 35A		11 57A					3 39P		4 00P						6 07P	6 58P	6 58P		8 10P	8 06P		
Ashland, VA		9 19A							4 24P		4 42P						6 50P	7 43P	7 43P		8 53P	8 49P		
RICHMOND, VA-Staples Mill Rd.	Ar	9 40A	11 50A	1 02P					4 40P		5 05P						7 02P	8 07P	8 07P		9 10P	9 10P		
	Dp	🛍 9 45A							4 45P								7 10P		8 10P					
Richmond, VA-Main St. Station		10 12A							5 12P								7 37P		8 37P					
Williamsburg, VA		L11 15A							L 6 10P								L 8 23P		L 9 33P					
Newport News, VA	Ar	11 50A							6 50P								9 10P		10 10P					
	Dp	*12 05P*							*7 05P*								*9 25P*		*10 25P*					
Norfolk, VA	Ar	D*12 50P*	To	To					D *7 50P*								D *9 55P*		D*10 55P*					
Virginia Beach, VA (ET)	Ar	*1 30P*	Savannah	Charlotte					*8 30P*								*10 25P*		*11 25P*					

Train Name ▶		Northeast Regional	Acela Express	Northeast Regional	Acela Express	Acela Express	Northeast Regional	Northeast Regional	Vermonter	Vermonter	Acela Express	Acela Express	Northeast Regional	Northeast Regional	Acela Express	Acela Express	Northeast Regional	Acela Express	Acela Express	Northeast Regional	Northeast Regional	Northeast Regional	Northeast Regional	Northeast Regional
Train Number ▶		173	2165	163	2167	2255	135	137	57	55	2171	2257	165	175	2259	2173	167	2297	2193	139	177	179	169	67
Days of Operation ▶		Mo-Fr	Mo-Fr	SaSu	Mo-Fr	Su	SaSu	Mo-Fr	SaSu	Mo-Fr	Mo-Fr	Su	SaSu	Mo-Fr	Su	Mo-Fr	Sa	Su	Mo-Fr	Su	Mo-Fr	Mo-Fr	SaSu	Daily
On Board Service ▶		RB🍴Q	RB✪🍴Q	RB🍴Q	RB✪🍴Q	RB✪🍴Q	RB🍴Q	RB🍴Q	RB🍴	RB🍴	RB✪🍴Q	RB✪🍴Q	RB🍴Q	RB🍴Q	RB✪🍴Q	RB✪🍴Q	RB🍴Q	RB✪🍴Q	RB✪🍴Q	RB🍴Q	RB🍴Q	RB🍴Q	RB🍴Q	RB🍴Q🛍
BOSTON, MA-South Sta. (ET)	Dp	11 05A	12 15P	11 40A	1 15P	1 10P	1 45P	1 30P	From	From	3 15P	3 10P	3 00P	3 20P	4 10P	4 30P	4 40P	5 10P	5 20P	5 40P	5 35P	6 45P	6 35P	🛍 9 45P
Boston, MA-Back Bay		R11 10A	R12 20P	R11 45A	R 1 20P	R 1 15P	R 1 50P	R 1 35P	Vermont	Vermont	R 3 20P	R 3 15P	R 3 05P	R 3 25P	R 4 15P	R 4 35P	R 4 45P	R 5 15P	R 5 25P	R 5 54P	R 5 40P	R 6 50P	R 6 40P	R 9 50P
Route 128, MA		R11 21A	R12 30P	R11 55A	R 1 29P	R 1 24P	R 2 00P	R 1 46P			R 3 29P	R 3 24P	R 3 15P	R 3 35P	R 4 24P	R 4 44P	R 4 55P	R 5 24P	R 5 34P	R 5 55P	R 5 51P	R 7 00P	R 6 50P	R10 00P
Providence, RI		11 51A	12 50P	12 20P	1 50P	1 49P	2 25P	2 10P			3 50P	3 49P	3 50P	3 59P	4 49P	5 05P	5 20P	5 49P	5 57P	6 20P	6 16P	7 25P	7 15P	🛍 10 25P
Kingston, RI (Newport 🚌) 92 94		12 13P		12 41P			2 46P	2 31P					4 11P	4 20P			5 41P			6 41P	6 37P	7 46P	7 36P	10 46P
Westerly, RI				12 56P				2 45P					4 26P				5 56P			6 56P	6 51P			11 01P
Mystic, CT													4 36P								7 01P		7 59P	11 12P
New London, CT (🚌 Casino)		12 46P		1 17P			3 19P	3 07P					4 50P	4 53P			6 17P			7 17P	7 15P	8 19P	8 13P	11 25P
Old Saybrook, CT		1 06P		1 36P				3 27P					5 09P	5 11P			6 36P			7 36P	7 34P		8 32P	11 46P
NEW HAVEN, CT	Ar	1 39P		2 09P			4 09P	4 08P					5 39P	5 45P			6 59P			8 09P	8 09P	9 10P	9 04P	12 20A
	Dp	1 41P	2 18P	2 11P	3 18P	3 18P	4 11P	4 11P	4 41P	4 41P	5 18P	5 18P	5 41P	5 48P	6 18P	6 38P	7 10P	7 18P	7 23P	8 11P	8 11P	9 15P	9 11P	🛍 12 45A
Bridgeport, CT		2 01P		2 31P			4 31P	4 31P	5 01P	5 01P			6 01P				7 31P			8 31P	8 31P		9 31P	
Stamford, CT		2 26P	2 57P	2 56P	3 57P	3 57P	4 56P	4 56P	5 28P	5 28P	5 57P	5 57P	6 26P	6 30P	6 57P	7 17P	7 56P	7 57P	8 02P	8 56P	8 56P	9 57P	9 56P	1 31A
New Rochelle, NY		2 45P		3 15P			5 15P	5 15P					6 45P				8 15P			9 15P	9 15P		10 15P	
NEW YORK, NY	Ar	3 16P	3 45P	3 50P	4 45P	4 45P	5 45P	6 00P	6 25P	6 41P	6 45P	6 45P	7 20P	7 45P	7 47P	8 05P	8 45P	8 45P	8 59P	9 45P	9 50P	10 45P	10 46P	2 20A
	Dp	3 35P	4 00P	4 05P	5 00P	5 00P	6 05P	6 20P	6 55P	7 05P	7 00P	7 00P	7 55P	8 00P	8 00P	8 15P	9 05P			10 05P	10 05P		11 05P	3 00A
Newark, NJ		3 52P	4 14P	4 22P	5 14P	5 14P	6 22P	6 37P	7 12P	7 21P	7 14P	7 14P	8 12P	8 17P	8 14P	8 29P	9 22P			10 22P	10 22P		11 22P	3 20A
Newark Liberty Intl. Air., NJ ✈				4 27P			6 28P	6 42P					8 18P	8 23P			9 28P			10 27P				
Metropark, NJ				4 42P		5 32P	6 43P	6 55P	7 35P			7 32P	8 35P	8 37P	8 32P		9 42P			10 41P	10 41P		11 40P	3 39A
Trenton, NJ				5 05P			7 05P	7 17P	8 00P	7 55P			8 57P	9 10P			10 05P			11 04P	11 03P		12 03A	4 06A
PHILADELPHIA, PA-30th St. Sta.	Ar	4 52P	5 07P	5 32P	6 09P	6 14P	7 32P	7 44P	8 27P	8 22P	8 07P	8 14P	9 24P	9 35P	9 14P	9 27P	10 32P			11 32P	11 30P		12 32A	4 38A
Wilmington, DE	Dp	5 17P	5 28P	5 57P	6 30P	6 35P	7 56P	8 07P	8 52P	8 47P	8 28P	8 35P	9 49P	10 00P	9 35P	9 48P	10 57P			11 56P	11 53P		12 57A	5 13A
Aberdeen, MD							8 32P																	
Baltimore, MD		6 02P	6 11P	6 47P	7 15P	7 21P	8 57P	8 52P	9 39P	9 35P	9 11P	9 21P	10 39P	10 43P	10 21P	10 31P	11 47P			12 46A	12 40A		1 46A	🛍 6 11A
BWI Thurgood Marsh. Air., MD ✈		6 15P	6 23P	7 00P	7 29P	7 33P	9 10P	9 05P	9 52P	9 51P	9 23P	9 33P	10 52P	11 00P	10 33P	10 43P	11 59P				12 53A			6 24A
New Carollton, MD		D 6 28P		D 7 13P			D 9 23P	D 9 18P	D10 05P	D10 14P			D11 05P	D11 18P			D12 12A				D 1 06A			L 6 45A
WASHINGTON, DC	Ar	6 46P	6 53P	7 32P	7 58P	8 00P	9 42P	9 37P	10 25P	10 30P	9 49P	10 00P	11 27P	11 34P	11 00P	11 14P	12 35A			1 25A	1 29A		2 25A	7 01A
	Dp																							🛍 7 30A
Alexandria, VA																								🛍 7 47A
Franconia-Springfield, VA																								7 54A
Woodbridge, VA																								
Quantico, VA																								8 16A
Fredericksburg, VA																								8 35A
Ashland, VA																								9 19A
RICHMOND, VA-Staples Mill Rd.	Ar																							9 40A
	Dp																							🛍 9 45A
Richmond, VA-Main St. Station																								10 12A
Williamsburg, VA																								L11 15A
Newport News, VA	Ar																							11 50A
	Dp																							*12 05P*
Norfolk, VA	Ar																							D*12 50P*
Virginia Beach, VA (ET)	Ar																							*1 30P*

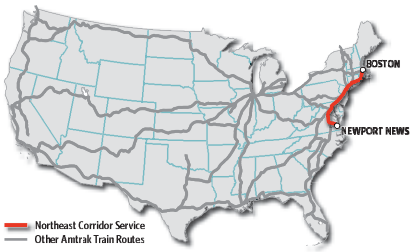
Service, Symbols and Reference Marks on other side.

Northbound Virginia Beach • Newport News • Richmond • Washington • Boston

Train Name ▶		Northeast Regional	Acela Express	Northeast Regional	Northeast Regional	Acela Express	Acela Express	Northeast Regional	Northeast Regional	Northeast Regional	Acela Express	Northeast Regional	Vermonter	Vermonter	Acela Express	Acela Express	Northeast Regional	Northeast Regional	Acela Express	Northeast Regional	Northeast Regional	Acela Express	Northeast Regional	Northeast Regional
Train Number ▶		66	2190	190	150	2150	2290	170	160	162	2154	172	54	56	2158	2250	86	164	2160	174	82	2252	84	88
Days of Operation ▶		Daily	Mo-Fr	Mo-Fr	SaSu	Mo-Fr	Sa	Mo-Fr	SaSu	SaSu	Mo-Fr	Mo-Fr	SaSu	Mo-Fr	Mo-Fr	SaSu	Mo-Fr	SaSu	Mo-Fr	Mo-Fr	Sa	Su	Mo-Fr	SaSu
On Board Service ▶		RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RB	RB	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RB	RBQ	RB	RB
Virginia Beach, VA (ET)	Dp	2 15P																						
Norfolk, VA	Dp	R 3 00P																						
Newport News, VA	Ar	4 00P																						
	Dp	4 20P																						
Williamsburg, VA QT		4 42P																						
Richmond, VA-Main St. Station QT		5 30P																						
RICHMOND, VA-Staples Mill Rd. QT	Ar	5 55P																						
	Dp	6 00P															6 00A				7 35A		8 00A	8 35A
Ashland, VA		6 13P															6 13A				7 48A		8 13A	8 48A
Fredericksburg, VA		6 58P															7 00A				8 33A		8 58A	9 33A
Quantico, VA		7 17P															7 19A				8 52A		9 17A	9 53A
Woodbridge, VA																	7 30A							10 05A
Franconia-Springfield, VA		7 35P																						
Alexandria, VA QT		7 46P															7 47A				9 20A		9 50A	10 25A
WASHINGTON, DC QT	Ar	8 25P															8 15A				9 45A		10 15A	10 50A
	Dp	10 00P		3 15A	3 15A	5 00A		5 02A	5 25A	6 20A	7 00A	7 25A	7 30A	8 10A	9 00A	9 00A	8 35A	9 25A	10 00A	10 25A	10 20A	11 00A	11 02A	11 25A
New Carrollton, MD QT		10 10P						R 5 14A	R 5 37A	R 6 32A		R 7 36A	R 7 42A	R 8 20A			8 46A	R 9 37A		R10 37A	10 32A		11 13A	11 37A
BWI Thurgood Marsh. Air., MD QT		10 30P						5 30A	5 53A	6 48A	7 20A	7 52A	7 58A	8 35A	9 20A	9 20A	9 03A	9 53A	10 20A	10 53A	10 48A	11 20A	11 29A	11 53A
Baltimore, MD QT		10 46P		3 55A	3 55A	5 30A		5 45A	6 09A	7 04A	7 36A	8 07A	8 12A	8 50A	9 36A	9 34A	9 19A	10 10A	10 34A	11 10A	11 04A	11 34A	11 44A	12 09P
Aberdeen, MD QT				4 19A	4 19A					7 28A											11 28A			
Wilmington, DE QT		11 36P		4 50A	4 50A	6 12A		6 30A	6 56A	7 56A	8 17A	8 54A	8 56A	9 35A	10 17A	10 17A	10 04A	10 56A	11 15A	11 55A	11 56A	12 17P	12 31P	12 56P
PHILADELPHIA, PA-30th St. Sta. QT		12 13A		5 15A	5 15A	6 32A		6 52A	7 20A	8 20A	8 37A	9 18A	9 20A	9 58A	10 37A	10 37A	10 27A	11 20A	11 35A	12 18P	12 20P	12 37P	12 54P	1 20P
Trenton, NJ QT		12 48A		5 45A	5 45A			7 20A	7 47A	8 47A		9 46A	9 47A	10 27A			10 55A	11 47A		12 47P	12 47P		1 22P	1 47P
Metropark, NJ QT		1 15A							8 08A	9 08A		10 09A	10 08A			11 20A	11 26A	12 08P		1 08P	1 08P	1 20P	1 43P	2 08P
Newark Liberty Intl. Air , NJ QT				6 16A	6 16A				8 21A			10 22A						12 21P		1 21P	1 21P			2 21P
Newark, NJ QT		1 32A		6 22A	6 22A	7 30A		7 56A	8 27A	9 24A	9 31A	10 27A	10 25A	11 04A	11 31A	11 36A	11 43A	12 27P	12 31P	1 27P	1 27P	1 36P	2 00P	2 27P
NEW YORK, NY QT	Ar	1 50A		6 40A	6 40A	7 47A		8 14A	8 45A	9 42A	9 47A	10 45A	10 45A	11 22A	11 47A	11 52A	12 01P	12 46P	12 47P	1 45P	1 47P	1 52P	2 18P	2 47P
	Dp	3 10A	6 20A	6 55A	7 00A	8 03A	8 03A	8 30A	9 00A	10 00A	10 03A	11 00A	11 30A	11 34A	12 03P	12 05P	12 30P	1 00P	1 03P	2 00P	2 00P	2 05P		3 00P
New Rochelle, NY QT								8 57A	9 27A	10 28A		11 28A						1 27P		2 27P	2 27P			3 27P
Stamford, CT QT		3 59A	7 04A	7 43A	7 47A	8 46A	8 46A	9 18A	9 48A	10 48A	10 46A	11 48A	12 18P	12 18P	12 46P	12 46P	1 16P	1 48P	1 46P	2 48P	2 48P	2 46P		3 48P
Bridgeport, CT QT								9 42A	10 12A	11 12A		12 12P	12 42P	12 42P				2 12P		3 12P	3 12P			4 12P
NEW HAVEN, CT QT	Ar	4 49A		8 29A	8 31A			10 06A	10 36A	11 36A		12 36P	1 06P	1 06P			2 00P	2 36P		3 36P	3 36P			4 36P
	Dp	4 55A	7 53A	8 31A	8 33A	9 29A	9 30A	10 10A	10 38A	11 38A	11 29A	12 38P			1 29P	1 30P	2 04P	2 38P	2 29P	3 38P	3 38P	3 30P		4 38P
Old Saybrook, CT		5 24A		9 00A	9 10A					12 08P		1 07P					2 36P	3 07P		4 07P				5 10P
New London, CT (Casino) QT		5 42A	L 8 40A	9 20A	9 31A			11 00A	11 28A	12 31P		1 32P					2 56P	3 26P		4 27P	4 31P			5 30P
Mystic, CT QT		5 54A		9 32A	9 46A					12 44P		1 44P						3 39P						
Westerly, RI QT		6 06A		9 43A	9 57A					12 55P		1 55P						3 50P		4 47P				
Kingston, RI (Newport) 92 94 QT		6 22A		10 00A	10 13A			11 32A	11 59A	1 11P		2 11P					3 27P	4 05P		5 03P	5 02P			6 03P
Providence, RI QT		7 04A	L 9 25A	10 23A	10 34A	L10 54A	L10 58A	11 54A	12 21P	1 33P	L12 54P	2 32P			L 2 54P	L 2 58P	3 53P	4 26P	L 3 52P	5 25P	5 24P	L 4 58P		6 25P
Route 128, MA QT		D 7 31A	D 9 49A	D10 49A	D10 58A	D11 26A	D11 26A	D12 18P	D12 43P	D 2 05P	D 1 28P	D 2 58P			D 3 24P	D 3 27P	D 4 30P	D 4 58P	D 4 20P	D 6 03P	D 5 53P	D 5 27P		D 6 54P
Boston, MA-Back Bay QT		D 7 47A	D10 00A	D10 59A	D11 10A	D11 37A	D11 36A	D12 28P	D12 54P	D 2 16P	D 1 37P	D 3 09P	To	To	D 3 33P	D 3 37P	D 4 41P	D 5 10P	D 4 29P	D 6 20P	D 6 04P	D 5 37P		D 7 05P
BOSTON, MA-South Sta. QT (ET)	Ar	7 52A	10 05A	11 05A	11 15A	11 42A	11 42A	12 33P	12 59P	2 21P	1 42P	3 15P	Vermont	Vermont	3 39P	3 41P	4 46P	5 15P	4 34P	6 25P	6 10P	5 42P		7 10P

Train Name ▶		Acela Express	Northeast Regional	Northeast Regional	Acela Express	Acela Express	Northeast Regional	Acela Express	Northeast Regional	Acela Express	Acela Express	Northeast Regional	Northeast Regional	Northeast Regional	Acela Express	Acela Express	Northeast Regional	Northeast Regional	Northeast Regional	Northeast Regional	Carolinian	Palmetto	Northeast Regional	Northeast Regional
Train Number ▶		2164	176	140	2166	2254	194	2168	94	2170	2256	148	168	132	2172	2258	178	146	136	166	80	90	66	78
Days of Operation ▶		Mo-Fr	Mo-Fr	SaSu	Mo-Fr	Su	SaSu	Mo-Fr	Mo-Fr	Mo-Fr	Su	Mo-Fr	Sa	Su	Mo-Fr	Su	Mo-Fr	Sa	Fr	Su	Daily	Daily	Daily	Fr
On Board Service ▶		RBQ	RBQ	RBQ	RBQ	RBQ	RB	RBQ	RB	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ	RBQ
Virginia Beach, VA (ET)	Dp						6 55A		7 00A												From Charlotte	From Savannah	2 15P	
Norfolk, VA	Dp						R 7 35A		R 7 40A														R 3 00P	
Newport News, VA	Ar						8 45A		8 50A														4 00P	
	Dp						9 00A		9 10A														4 20P	8 30P
Williamsburg, VA QT							9 26A		9 36A														4 42P	8 53P
Richmond, VA-Main St. Station QT							10 17A		10 27A														5 30P	
RICHMOND, VA-Staples Mill Rd. QT	Ar						10 45A		10 55A														5 55P	10 10P
	Dp						10 50A		11 00A												2 46P	5 25P	6 00P	
Ashland, VA							11 05A		11 15A														6 13P	
Fredericksburg, VA							11 49A		11 59A												3 41P		6 58P	
Quantico, VA							12 09P		12 19P												4 01P		7 17P	
Woodbridge, VA																								
Franconia-Springfield, VA																							7 35P	
Alexandria, VA QT							12 40P		12 50P												4 32P	7 10P	7 46P	
WASHINGTON, DC QT	Ar						1 05P		1 30P												D 5 08P	D 7 57P	8 25P	
	Dp	12 00N	12 05P	12 25P	1 00P	1 00P	1 25P	2 00P	2 05P	3 00P	3 00P	3 02P	3 25P	3 25P	4 00P	4 00P	4 05P	4 25P	5 05P	5 20P			10 00P	
New Carrollton, MD QT			R 12 16P	R12 37P			1 37P		2 16P			R 3 13P	R 3 37P	R 3 37P			R 4 16P	R 4 37P	R 5 17P	R 5 32P			10 10P	
BWI Thurgood Marsh. Air., MD QT			12 32P	12 54P		1 20P	1 53P		2 32P	3 20P	3 20P	3 31P	3 53P	3 53P		4 20P	4 32P	4 53P	5 33P	5 48P			10 30P	
Baltimore, MD QT		12 30P	12 47P	1 09P	1 30P	1 34P	2 09P	2 30P	2 47P	3 34P	3 34P	3 46P	4 09P	4 09P	4 30P	4 34P	4 47P	5 09P	5 49P	6 04P	D 6 07P	D 8 50P	10 46P	
Aberdeen, MD QT												4 09P								6 28P				
Wilmington, DE QT		1 12P	1 34P	1 56P	2 12P	2 17P	2 56P	3 12P	3 34P	4 15P	4 17P	4 35P	4 56P	4 56P	5 12P	5 17P	5 32P	5 56P	6 38P	6 56P	D 7 00P	D 9 41P	11 36P	
PHILADELPHIA, PA-30th St. Sta. QT		1 32P	1 58P	2 20P	2 32P	2 37P	3 20P	3 32P	3 58P	4 35P	4 37P	4 58P	5 20P	5 20P	5 32P	5 37P	5 55P	6 20P	7 02P	7 20P	D 7 24P	D10 07P	12 13A	
Trenton, NJ QT			2 25P	2 47P			3 47P		4 25P			5 27P	5 47P	5 47P			6 23P	6 47P	7 30P	7 47P	D 7 58P	D10 47P	12 48A	
Metropark, NJ QT		2 16P	2 49P	3 08P	3 17P	3 20P	4 08P	4 17P			5 20P	5 52P	6 08P	6 08P	6 18P	6 20P		7 08P	L 8 03P	8 08P			1 15A	
Newark Liberty Intl. Air., NJ QT				3 21P			4 20P		5 00P			6 03P	6 21P	6 21P			6 56P		L 8 15P	8 21P				
Newark, NJ QT		2 31P	3 04P	3 27P	3 34P	3 36P	4 26P	4 34P	5 07P	5 34P	5 36P	6 10P	6 27P	6 27P	6 34P	6 36P	7 01P	7 25P	L 8 20P	8 26P	D 8 37P	D11 27P	1 32A	
NEW YORK, NY QT	Ar	2 47P	3 22P	3 47P	3 50P	3 52P	4 46P	4 50P	5 25P	5 50P	5 52P	6 31P	6 47P	6 47P	6 52P	6 52P	7 19P	7 46P	8 38P	8 46P	8 58P	11 47P	1 50A	
	Dp	3 00P	3 30P	4 30P	4 00P	4 05P	5 00P	5 00P	5 40P	6 00P	6 05P	6 43P	7 00P	7 30P	7 00P	7 05P	7 30P	8 00P	9 07P	9 00P			3 10A	
New Rochelle, NY QT			3 57P	4 57P								7 10P	7 27P	7 57P			8 15P	8 27P	9 35P	9 27P				
Stamford, CT QT			4 18P	5 18P		4 46P	5 48P	5 46P	6 29P	6 44P	6 46P	7 30P	7 48P	8 18P	7 44P	7 46P	8 35P	8 48P	9 56P	9 48P			3 59A	
Bridgeport, CT QT			4 42P	5 42P								7 54P	8 12P	8 42P			9 05P		10 20P					
NEW HAVEN, CT QT	Ar		5 06P	6 06P			6 33P		7 14P			8 19P	8 36P	9 06P			9 30P	9 33P	10 44P	10 33P			4 49A	
	Dp		5 30P	6 21P	5 24P	5 30P	6 35P	6 30P	7 30P		7 30P	8 30P	8 38P	9 08P	8 28P	8 37P	9 32P	9 50P	11 00P	10 36P			4 55A	
Old Saybrook, CT			6 02P				7 04P		8 03P				9 12P	9 44P			10 01P			11 05P			5 24A	
New London, CT (Casino) QT			6 22P				7 23P		8 25P				9 31P	10 04P	L 9 05P		10 20P			11 24P			5 42A	
Mystic, CT QT													9 44P	10 18P			10 35P						5 54A	
Westerly, RI QT			6 42P				7 43P						9 55P	10 28P			10 46P						6 06A	
Kingston, RI (Newport) 92 94 QT			6 57P				7 59P		8 57P				10 11P	10 43P			11 06P			11 56P			6 22A	
Providence, RI QT		L 5 52P	7 19P		L 6 51P	L 6 54P	8 20P	L 8 00P	9 20P	L 8 55P	L 8 58P		10 32P	11 05P	L 9 52P	L10 09P	11 27P			12 17A			7 04A	
Route 128, MA QT		D 6 19P	D 7 45P		D 7 21P	D 7 16P	D 8 49P	D 8 32P	D 9 49P	D 9 25P	D 9 26P		D10 59P	D11 29P	D10 27P	D10 30P	D11 59P			D12 43A			D 7 31A	
Boston, MA-Back Bay QT		D 6 28P	D 8 00P	To	D 7 31P	D 7 32P	D 9 00P	D 8 41P	D10 00P	D 9 40P	D 9 36P	To	D11 10P	D11 40P	D10 37P	D10 40P	D12 10A	To	To	D12 54A			D 7 47A	
BOSTON, MA-South Sta. QT (ET)	Ar	6 33P	8 05P	Springfield	7 36P	7 37P	9 05P	8 46P	10 05P	9 45P	9 41P	Springfield	11 15P	11 45P	10 42P	10 45P	12 15A	Springfield	Springfield	12 59A			7 52A	

BOSTON and NEWPORT NEWS ROUTE MAP and SYMBOLS



A Time Symbol for A.M.
N Time Symbol for Noon.
P Time Symbol for P.M.
D Stops only to discharge passengers; train may leave before time shown.
L Stops to receive and discharge passengers; train may leave before time shown.
R Stops only to receive passengers.
ET Eastern time
Bus stop
Checked baggage
Airport connection
Ferry connection
QT Quik-Trak self-serve ticketing kiosk

Service on the Northeast Corridor Boston and Newport News

R **Coaches: Reservations required.**
B **Business class** service available.
First class service available.
Q Amtrak Quiet car.
Sandwiches, snacks and beverages.
92 Van/Car service available from Kingston, RI station to Newport, RI. Reservations required. Call 401-295-1100 for information and reservations.
94 Martha's Ferry - seasonal shuttle service from Kingston, R.I. station to Quonset Point, R.I. Operated by Fast Ferry. Reservations required. Call (401) 295-4040 for information and reservations.

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Shading Key	
Reserved Acela Express service	Long-distance service train
Reserved Regional train	Thruway and connecting local service

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